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# The Journal of HEREDITY

*A monthly publication devoted to Plant Breeding Animal Breeding and Eugenics*

A MULE FAMILY

(See Page 413)

**Do Prominent Families Die Out?**

**Progress in Fig Breeding**

**Number of Feebleminded in U. S.**

**Metcalf Suit Withdrawn**

**Inheritance in Goats**

SEPTEMBER, 1928 Vol. 19, No. 9

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*The*

# Journal of Heredity

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**QUINTUPLET LAMBS—AN UNUSUALLY LARGE FAMILY**

**Frontispiece**

IT is quite common that ewes produce twins and even triplets. However, it is not so often that all of the triplets survive. Very seldom does a ewe produce more than three lambs at one time and this makes all the more unusual the production of five lambs by one ewe all of which were vigorous enough to be "on their feet" within thirty minutes after they were dropped. All of the lambs were kept with the ewe for a few days, after which three were removed and reared as bottle lambs. The lambs were dropped in April, 1928. In 1927 the ewe gave birth to twins. She is a Rambouillet-Cotswold cross-bred ewe and is the property of George Rust, Victor, Idaho.

J. E. NORDBY,
*University of Idaho,*
*Moscow, Idaho.*

# SETTLEMENT OF METCALF BEQUEST SUIT

## Validity of Will Upheld, with Mrs. Metcalf and A. G. A. Contributing Equally to Fund for Children

SINCE our announcement in the May JOURNAL of no change in the Metcalf will case, events have moved rapidly. The nature of the negotiations has made it inadvisable to discuss the matter during their progress, so the case could only receive casual notice in the August number. Since that time we are gratified to be able to announce that an agreement has been reached which appears to be to the best interest of all parties.

### History of the Case

Upon learning that Mr. Metcalf's will was being contested, our President, Dr. Fairchild, recommended that the interests of the Association be placed in the hands of the firm of Peelle, Ogilby, and Lesh, of Washington. Mr. Stanton Peelle, long a friend of the Association, has specialized in probate law, making his advice of particular value in this contest. Our Washington attorneys entrusted the case at the scene of the contest to Mr. C. A. Kutcher of Sheridan, Wyoming. Mr. Kutcher's able handling of the case has been a very important factor in consummating the present settlement.

Before this time we had been in touch with Prof. John W. Scott, Wyoming member of the Advisory Committee. Through him we obtained valuable information as to local conditions, and confirmation of the view we had already taken of the absurdity of questioning Mr. Metcalf's sanity. After the preliminaries were arranged the case appeared to have reached a point where little that might be considered as "news" for our members was to be expected until the trial. By the latter part of May our attorneys had largely completed the preparation of the case, which was scheduled to come before the fall session of the court.

The initiation of the negotiations that finally resulted in a settlement came through another member of the Advisory Committee, Professor W. S. Anderson of the University of Kentucky. Shortly after the announcement in the Journal of the suit to set aside the will, Professor Anderson had written that he was in touch with Mrs. Metcalf's brother, J. H. Martin, in charge of the Poultry Department of the University of Kentucky. During the latter part of May Mr. Martin presented to Professor Anderson, as the nearest representative of the Association, a proposal that the contest would be withdrawn if the Association would set aside from its half of the estate a fund for the support and education of the children. Professor Anderson transmitted this to the Council and urged the desirability of making a settlement that would provide definitely for the future of Mr. Metcalf's three minor children. The amount of this fund was suggested as $55,000.00.

On May 24 Messrs. Peelle and Kutcher met the Council informally in Washington. This was the first opportunity that the Council had had to learn at first hand of conditions at the scene of the contest. The proposal transmitted by Professor Anderson was then considered. Some of the members of the Council were definitely opposed to any compromise that would interfere with a trial of the case in court, and a thorough vindication of the sanity of the will. Others expressed themselves as being in favor of the creation of such a fund on an equitable basis of sharing this responsibility with Mrs. Metcalf. The legal advice of Messrs. Peelle and Kutcher sustained this view, not only on

grounds of fairness to the children, but also in view of the uncertain action of local juries in cases of this nature. There could be no assurance that the question of the sanity of Mr. Metcalf would determine the outcome of the suit, with local prejudice and sympathies playing an undeterminable part.

The members of the Council present finally agreed that our attorneys should proceed with the negotiations of such a settlement on the basis of the Association's participating equally with Mrs. Metcalf in establishing a fund of $55,000.00 for the benefit of the children. In accepting the present arrangement a number of considerations made such a course desirable. The fund whcih has been set aside will provide a sufficient amount for the education of Mr. Metcalf's children, and a substantial sum when they come of age. The ill feeling and possibly adverse publicity engendered by the trial is avoided, and the amount of the Association's contribution to the fund might easily have been dissipated in an extended litigation, during which the distribution of the estate would have been tied up. After considerable negotiations and several delays this proposal has been accepted and approved by the American Genetic Association at a meeting of its Council on August 22.

After the payment of the necessary expenses and the establishment of the fund for Mr. Metcalf's children, the A. G. A. will come into a substantial endowment, the income of which will be available to promote the study of heredity. Fourteen years ago the Council of the A. G. A. decided that the best way to encourage "the increase and diffusion of knowledge regarding heredity" was by the publication of a monthly magazine which made a special feature of the best possible illustrations of the variations in form which constitute the basic material for the study of heredity. Experience has justified the wisdom of this course, but as the friends of the Association know, the publication of our JOURNAL has absorbed practically the entire income of the Association, and from time to time it has been necessary to solicit contributions from members to make up the deficit. This bequest makes possible the stabilization of our finances and the more rapid development of the JOURNAL at a time when we are just on the threshold of the study of heredity—especially human heredity. In the years to come we are confident that the founder of the Metcalf Fund will be more and more appreciated for the pioneer nature of his bequest.

Mr. Metcalf led such an unostentatious life that it has been difficult to get a good picture of him for publication in the JOURNAL. Arrangements have been completed to have an appreciation of his life prepared by Professor Anderson in collaboration with Mr. Martin and Mrs. Metcalf. It is hoped that this will be ready for publication in the November number of the JOURNAL.

# PERPETUATION OF OLD FAMILIES

## Inheritance of the Parental Instincts and "Social Conification"

F. A. Woods

HEREDITY and environment are inextricably intertwined in the growth and development of any one individual. In spite of this, it is sometimes possible to measure some *specific differences* between two or more individuals and determine whether differences in the genes (heredity) or differences in nurture are responsible for the observed differences. [3 4 6 7 14]

Most so-called researches on human mental heredity do not lead to anything more definite than the general conclusion that heredity and environment working together are responsible. In the pioneer investigations of Galton, Candoble, Odin, Ellis and others, it is usually impossible to separate the environmental factor. The same criticism can generally be raised against the well-known studies of degenerate families such as the Jukes, Nams, Kallikaks and others. Even the Jukes-Edwards contrast carries with it the same environment complexity. The lines of descent which had the best heredity also had the best opportunities, greater wealth and better education.

The study of twins, however, has lead to some positive conclusions in favor of heredity (genetic differences) at least in regard to intelligence and probably some outstanding characteristics of health, disposition and character. Personally, the distribution of mental differences to be found in the genealogical study of royalty has convinced me that germ-plasm differences ordinarily far outweigh environmental differences.[2] The recent case published in the JOURNAL OF HEREDITY* of two mature sisters who are twins, and by chance were separated when only a few weeks old gives a very unusual opportunity to study this question. Their intelligence quotients (I. Qs.) are almost identical (both much above the average) which is very unlikely on any grounds other than genetic causation.

If, as appears likely, heredity is very important in producing mental differences in individual people, it should also be important in producing differences in groups of people—races, nations and social classes. If heredity be strong it should make the upper social classes inherently superior in intelligence. It leads to a belief in the biological importance of aristocracy, the value of good stock over poor stock and the strength of leadership. It leads to a process which I have called *aristogenesis* or *conification*[6,9]. By conification I mean that the upper social strata tend to become very much removed from the lower. The superior classes also become numerically fewer and fewer in percentage comparison with the total population, though not necessarily fewer in actual numbers. The "social cone" becomes more and more attenuated and pointed. During this process an actual mental evolution takes place within the upper portion of the cone.[2, 11, 12, 13] This mental evolution is inevitable and continues until something happens to make the cone break or crumble at the top.

This conception is based on a strong heredity, strong assortative mating, unequal distribution of wealth and positive correlations of good qualities. There has been considerable discussion of this "conification" idea of late by

*POPENOE, P. 13: 142-144; MULLER, H. J., 16: 432-454; BURKS, BARBARA, 17: 193-195. See also the various studies of twins by H. H. Newman, E. L. Thorndike and H. H. Wilder, and others.

general writers (Ireland, Wiggam, Stoddard). This has stimulated me to seek further proofs of its validity. Several of these have been found recently, some of which have been already published in THE JOURNAL OF HEREDITY[11, 12, 13]. A general survey of the various researches is presented in *Metron, International Review of Statistics*, July, 1928. Furthermore, I have statistical results not yet written up; but all are pointing in the same direction, and indicating that conification is a general law of historical change. Nothing has yet been found in conflict with such a view.

In the present article I wish to present some data and conclusions bearing on one point, essential to a general view of this sort. This one point which is important concerns the *biological stability* of families, especially those that are wealthy or socially prominent. If these do not endure, then this particular view of human progress loses something. If these families do endure then the picture of the "social cone" is made more clear and its parts hold together.

**Inheritance of the Parental Instinct**

The endurance of aristocratic families is probably in part at least due to an unusual amount of family pride and desire to perpetuate the family name. To a certain extent this may become hereditary in the surviving lines by a process of natural selection and thus the parental instinct may become in these people stronger than it is in the average.

Recently in an American college an interesting general question was asked the students. A large group of young men were requested to fill out a brief questionnaire relative to their ambitions in life, the things they hoped to accomplish within a few stated years—their ideals and hopes. The questions were strictly confidential, and the answers were presumably correspondingly frank. A large number wished to travel and see the world, but the most frequently expressed hope was to marry and maintain a home.

The desire to have children did not figure so strongly in the imagination of these young men. It would be interesting to know how great the desire for children is in various groups of people. It appears greater among orientals than in occidentals, among Catholics than among Protestants, among Jews than among Gentiles and, on the face of it, among the poor than among the rich. But we must not confuse the mere having of children with the desire to have children.

It is not at all certain that, say the lower slum classes or the hill-town degenerates who have such notoriously large families really desire so many children. Many of the investigators who are sent by institutions to study these people report that the mothers do not wish these large families. However that may be, the motives back of the desire for parenthood are somewhat different among diverse races and various social classes.

Among the Japanese and Chinese the desire to perpetuate the male line appears paramount. Daughters are a matter for condolence; for if a man has no son and heir he has no one to keep his memory green. Ancestor worship means also descendant worship.

Among savages, on the contrary, the genealogical imagination is evidently reduced to a minimum and there are many groups of mankind today who neither know nor care who are the fathers of the children. The desire for parenthood is undoubtedly strong among the females. Just what form it takes among the males is a question. It appears to be a general feeling of enjoying the presence of little children, of liking to play with them and liking to provide food for them and seeing them grow up. Certainly any groups who do possess as an ideal a desire for *family continuity* to keep alive the name or perpetuate the power that would otherwise die with the individual have, other things equal, a likelihood

of a larger posterity than those groups who lack it.

It is said that in ancient Greece and Rome as soon as the upper classes became wealthy and luxurious they ceased to have children. If they did it would certainly put an end to their particular breeds and account largely for the fall of these famous civilizations.

European nobility and royalty, on the contrary, have not shown a similar phenomenon, and their historical and biological contribution to this question of the parental instinct will now be considered.

The aristocratic classes in Europe have always or at least since about the eleventh century maintained their family pedigrees with a certain amount of pride. Not until about the fifteenth century, however, do we find much evidence of any conscious collecting and recording of family records such as charts showing descents, marriages and ancestors. The visitations of heralds, as they are called, showing genealogical tables did not begin until the sixteenth century in England.

The kings, counts and barons of the eleventh, twelfth and thirteenth centuries were very anxious to increase their individual power chiefly one against another. They also showed a great desire to hand that power on to their children and their grandchildren, to provide for their daughters as well as for their sons.

In some countries, as in England, where primogeniture prevailed, with entailed estates, there seems to be a wish to perpetuate a single or male-line, something like the famous ancient male-lines in China, Japan and India, but usually on the continent the motive appears to be the more simple and wordly one of providing for one's offspring.

The constant struggle for increased wealth and power is seen during these early centuries among all classes of the nobility both in times of war and in times of peace. Bold and ambitious warriors fought under their chieftains and expected and received compensation if victorious. Estates passed from one family to another as a result of warfare, and during times of peace some able retainers received promotions and appointments at the expense of others, or by skillful management increased the value of their landed estates. Many a great peer owned dozens of manors in addition to numerous castles. The wealth of the nobles was almost entirely in land, in dwellings, and in slaves, but it was power through wealth, not so different from the present day. And it was wealth that could be transmitted to the next generation.

The families of rank and wealth intermarried to a considerable extent. They did not always make alliances into precisely the same rank as their own. Generally a large proportion of the offspring would find marriages into families either slightly higher or slightly lower than their own, as for instance a knightly family united with that of a baron or a baronial house with that of an earl. A powerful earl might establish a connection with the royal line. There never was any fixed cast system as in India and consequently there occurred a good deal of shifting up and down in the social scale, all of which favored the formative process which I am here describing.

Whenever we find a male-line rising in wealth and importance we almost always find that for several generations the male heirs had been marrying into families more illustrious than their own or had acquired large estates through unions with sole heiresses. There can be no question of the reality of this struggle for power, increased through a kind of sexual selection in which, not as in the animal kingdom the individuals took much part in the choosing, but in which the chief roles were played by the parents.

According to any theory of a strong heredity—that is, any interpretation of

history which places great importance on the control of inborn determiners, this constant struggle in the marriage market ought to produce increased ability in some family lines at the expense of others. The successful tended to mate their children with the successful, while the unsuccessful were, on the whole, pushed down and out of the upper or governing class. This struggle, along with other biological forces, leads to what I have alluded to as social conification.

The early noble families should have from purely biological reasons (merely as a breeding experiment) been able to exhibit a large number of individuals whose special aptitudes were along the lines of war and government. That such was the case can scarcely be denied. Although we do not know much about their individual lives, we know that their reputation as a whole was decidedly good in precisely these directions. Their mode of government was harsh and bore heavily on the lower classes, but they established law and order. Their skill in organization is recognized everywhere by historians. They had a strong idea of discipline and of service towards their superiors —excellent traits in a feudalistic society.

They were also extremely jealous of each other and of the royal power so that unless the leader happened to be a strong character he could not hold his place among them. The entire history of Europe during feudal, and indeed post-feudal times, shows that the mere title of sovereign counted for little if the monarch lacked personal strength of character or practical judgment. Over and over again such weak monarchs were deposed, imprisoned, murdered, defeated in battle or obliged to bow to the wills of the nobles or of some strong member of their own family. A histriometric analysis of the subject is to be found in *The Influence of Monarchs* (Macmillan, 1913).

They—the nobles and the royalties alike—were ambitious, brave, energetic, cruel, grasping and proud. Usually loyal and honorable, we find them occasionally extremely dishonorable and unwilling to keep their sworn promises. Their frequent acts of treachery seem to us today perhaps the most revolting of any of the accounts of their conduct, unless it be the equally frequent scenes of cold-blooded murder.

Their lives were active, practical, violent, and they were devoted to out-of-door life. They cared nothing for, and even despised, the cities.

Such is the picture of the characteristic nobleman of the middle ages. It is an idealized or composite likeness. No one man corresponds to this composite or has all of these traits. Many indeed were entirely different from the standard type. Thus Henry III of England (1216-1272) is described as refined, pious and free from cruelty, but lacking in energy and ability. King Edward II (1307-1327) was mild and indolent, "no acts of injustice nor of oppression were imputed to him, yet he was deposed from the throne and murdered in prison."

It would be easy to find in various other European countries during the same period a few scattering examples of well-meaning, mild-mannered, yet indolent and incapable rulers. These characters, who represent the reverse of the usual bold, arbitrary, and ambitious leader, are not very frequently found in the royal lines. Nor are they to be often expected from the working of heredity and marriage selection. The existance of a few of them is, however, to be expected, since their ancestry was not entirely made up of the ambitious type, like the ancestry of thorough-bred race horses. From the stock of thorough-bred race horses we never get a lazy and unambitious horse, or if we ever do, he certainly must be a curiosity.

Undoubtedly among the lesser known noble lines there were many scattering examples of mild, well-intentioned but unambitious men, but these have left

no records of their private lives. Many of them perhaps retired to the cloister. At any rate, they were not the ones who forged ahead and raised their families to greater prestige. So we get what we might expect from the action of heredity and selection, pure and simple, in the building up of these powerful families. Now, what shall we say about their disappearance?

Strong families should not disappear except for cause. It has often been stated that these early European families, like all families holding high rank, soon passed out of existence. Indeed this has been asserted over and over again to illustrate the sad futility of human endeavor and sometimes to raise an objection against the practical possibility of the ideal of eugenics.

Most people believe that old families die out and also that the reason they die out is because they become decayed through old age, or are made weak and lazy through luxury, or enfeebled through close inter-marriages. Not only are all these reasons wrong biologically to account for the phenomenon were it a fact, but as a matter of fact there is no such phenomenon that needs to be accounted for.

Superficially or at first glance it would seem to anyone dealing with history and genealogy that of course old families die out. Take up *Burke's Extinct Peerage*, for instance, and see the great array of names no longer in existance. Naturally one would find them here since this book deals only with peerages that are extinct. Take then, the list of the barons who secured Magna Charta. Most of the names are gone. Take any list of the important families in an American city two hundred years ago (say New York, Boston or Philadelphia) and the families have apparently disappeared to a great extent.

The first answer to this statement is that while it is true that there are fewer male-lines, fewer family names than formerly, much of this is due to some names gaining numbers at the expense of others. If sons are born then the name continues, but if only daughters are born then the name ends. The effect of this can be made clear by starting say with ten families. Some of these will have both boys and girls, but probably one at least will have only girls. Then there will be only nine family names in existence. The name that is gone is gone forever. In the next generation it is probable that one of the nine will fail to have sons and then there will be but eight left. So in each generation the chances are always working towards reducing the total number of names. At the same time one of the names is gaining over all the others and, if new names are not assumed in the end theoretically everybody will have the same surname.

The same is true in tendency if we start with 100 names or 100,000. In this way the names of Smith and Brown have presumably gained at the expense of say Tanner and Green. However this may be in regard to the particular names there can be no question of the truth of the phenomenon. It is certain from theoretical grounds since a name once lost is never recovered, at least biologically. It is also very easy to see in the records of historic families this phenomenon illustrated by merely glancnig at the printed pages of a few standard books of reference.

If we take up any book containing the genealogical table of the sovereign houses of the world from the beginning of historic time onward we find that one after another of dynasties held their sway and then departed.

The boast of heraldry, the pomp of power,
All that beauty, all that wealth ere gave
Await alike the inevitable hour—
The paths of glory lead but to the grave.

These lines from Gray's Elegy seem to apply to families as well as to individuals. Indeed one man, a French professor named Jacobi, wrote a whole book on the subject and tried to show that there was a tendency to degener-

acy, insanity and sterility in the royal families. If he had looked into another and differently constructed royal genealogy he would have saved himself the trouble of writing his own book.

If we start with a definite number of male lines at any past date, most of them will be found to vanish, but if we reverse this process and start with any definite number of royal families of today and trace them back we find a very different picture.

There are not many books that show these facts at all well, but there are at least two such works. Both of them are rare and expensive. They were compiled with great thoroughness. One is P. E. Lehr's genealogy, which traces male and female lines, the complete pedigrees for only a few families (4096 ancestors in the twelfth generation), and the other is von Behr's *Genealogie der in Europa Riegierenden Furstenhauser*. This latter work traces back in the male-line only all the royal families of the present day. Some of these are reigning and some are non-reigning, but all are what is known as royal families of the first grade, that is, they have the full right of marriage with reigning houses on terms of equality. Most of them are Germanic in origin taking their beginnings not far from the shores of the Baltic. Some of them are branches from single stems showing what could occur when many sons chanced to be born. Only a very few are of recent origin. Such a one is the Swedish royal family which dates from Bernadotte in the beginning of the nineteenth century. Also the House of Bonaparte is included.

Nearly every one of these male lines when traced back exhibits in each generation little change in rank or title and nearly every one shows a continuous position of nobility or royalty traceable as early as the eleventh century. Where is the degeneracy and sterility here? These are the male lines that have for one reason or another survived, prospered and multiplied. The whole picture is painted in accordance with the laws of probability. Thus the male descendants of Hugh Capet were very numerous. They held the throne of France from the tenth century to the nineteenth. The royal house of Portugal was an offshoot which lasted many generations. The present King of Spain is a lineal male descendant of Hugh Capet through Philip V of Spain and Louis XIV of France. In addition to these royal ramifications there were several non-royal branches given off which took their origin in the same beginning.

The ancient family of Wettin (the royal house of Saxony) has also been fortunate in its many male branches. It established Saxe-Coburg-Gotha, Saxe-Altenburg and Saxe-Meiningen. Through Saxe-Coburg-Gotha it is represented as the present royal family of the British Empire. It is the family name of the sovereigns of Belgium and Bulgaria and also of the ex-king of Portugal.

Another male line that happened to amplify and gain great power is that of the King of Denmark. The house of Oldenburg from which he descends has not only retained the throne of Denmark for many centuries, but also through one of its branches achieved the throne of Russia. It is the right name of the so-called Romanoffs, who disappeared at the time of Catherine the Great. The Danish house is also the origin of the Greek royal family.

In the same way the house Lorraine beginning about the tenth century made its great advance in worldly power by achieving the thrones of Austria, Hungary, and Bohemia, and also by multiplying and branching into Italy. They are called Hapsburgs, but their male line is Lorraine.

It is sometimes insinuated that the Hohenzollerns are nothing but parvenues as their title of sovereign only goes back to the seventeenth century, but the truth is that they were powerful nobles as early as the twelfth cen-

tury, and practically all their marriages were with the same class.

The desire for children is in part an inheritable instinct. It should be on *a priori* grounds strong in royal and noble families and, as a matter of history, it evidently has been and is today, and it has prevented any extinction of the breeds as a whole. There are three or four thousand living royalties in Europe today. They are still having large families. Thus in a general way these royal families that have many branches balance those that have disappeared.

### Evidences from the Nobility

In Scotland there are at least two instances of ancient noble families that have increased enormously in the ramifications of their male lines. These are exemplified in the well-known names of Steward (Stewart) (Stuart) and Hamilton. There are others like Douglas, Gordon, and Campbell, but it takes a good deal of careful research to prove the genuine nature of their pedigrees. One has to be sure that they have not changed their names or adopted these famous cognomens. Many people who bear these names are descended from the various retainers and followers of the old chiefs and took the names of the heads of their clans. In the cases of Stewart and Hamilton, there are dozens of peers, baronets, knights and distinguished commoners who unquestionably can trace their descent in the male line directly to the original founders at the time of the Norman conquest.

In order to decide statistically to what extent noble families of today are of ancient aristocratic lineage, I have made a careful study of facts as they exist in the history of the British Peerage, including Scotland and Ireland. The result of this research has led to the conclusion that the usual off-hand statements of historians regarding changes in the social order are entirely wrong. There is much more persistence of old families than is commonly supposed.

*Burke's Peerage,* as every critical professional genealogist knows, is not sufficiently reliable for ancient pedigrees unless supported by documentary proofs. It will be conceded, however, that it is accurate enough for the purposes of this investigation. Most of the questionable statements in this standard work of reference concern very early pedigrees hidden more or less in the mist of antiquity prior to the year 1450, which is the initial date in the present research.

The facts are as follows: Democracy or no democracy, more than half of the peers of Great Britain and Ireland today can trace their descent in the male line back to ancestors already in the social position of gentry or higher usually with titles as early as the middle of the fifteenth century. And that means prior to the Wars of the Roses, which wars historians are always asserting killed off a large percentage—indeed a majority of the aristocracy.

The male lines alone are here considered. The lines have been in each case traced down very carefully to see that the family name has not been changed from the fathers to the mothers. This has occurred rather frequently, but these are not included in this list. For instance, the Duke of Northumberland is not in the male line a Percy but in reality is a Smithson. English families for the sake of preserving an historic name often do this, always changing from the less noted to the more noted. There is an example in the peerage where for the sake of property and in compliance with the terms of a will a man changed his surname from a famous Norman one to that of Jones or Jackson or some similar name, but the will neglected to state that the grandchildren could not change it back again. Thus, by another generation, they were going along all right again, having both the name and the property.

All this, which may have a some-

what humorous aspect in the light of modern democracy, nevertheless shows how much an ancient aristocracy does care for the perpetuation of the name. It brings added though minor proof of the thesis now under way.

The following is the list of British peers taken from *Burke's Peerage,* edition of 1921, whose male lines can be traced with certainty to the middle of the fifteenth century or earlier. (Table I.)

A goodly number of these ancient male lines repeat themselves in the peerage two or more times, and are consequently represented today by two or more titles. In the process of natural selection, or due to what may best be called the fortunes of war and peace, some lines have chanced to multiply. Often political preferment or the existence of many male offspring, or ability among younger sons—some or all of these reasons have favored the perpetuation of certain families. While other ancient names have by chance disappeared from the peerage, these are the ones that have actually multiplied.

The accompanying table (p. 397) shows (by the large number of names in brackets) how frequently two or more titles are today derived from a single source. These have not disappeared; they have flourished and ramified. At the left in each case is the family name and approximate date of entrance into what may be justly called aristocracy. These are the earliest dates to which these families can be traced. The ability to trace a pedigree in the history of England is itself almost a proof of aristocratic position.

It is different in America, where complete pedigrees can usually be made up for all grades of society. In England only the more important families have been written about, and the ease with which the pedigree can be traced is directly proportional to the social position of the family at any particular time.

At the dates of first emergence into the upper circles of the "social cone" some of these families gained titles such as baron or knight. Some were noble or knightly, others for a time were of the landed gentry, but were soon connected by marriage with more powerful families. All of these families have climbed upward almost from the start. In this group I have only found one single instance of a family that was once highly placed, sinking afterwards to the yeoman rank, and then rising again.

There are no less than twelve peers in the family of Stewart lineally descended from the first Steward of the King of Scotland. This steward was keeper of the royal exchequer, hence the checks in the Stewart arms. He was descended from a Norman follower of William the Conqueror. There are five branches of Hamilton and five of Erskine. The Hamiltons have held their aristocratic position since the 13th century, the Erskines since the 12th.

The Howards also are represented today by the five peerages—Carlisle, Effington, Howard of Glossip, Norfolk, and Suffolk. This is perhaps the best known of any of the names in the English peerage. It dates from pre-Norman days.

The following families are represented in four branches: Butler, Campbell, Douglas, Fitzgerald, which has the same origin as Fitzmaurice, Russell (not as old as the others but dating from about the middle of the 15th century), and Stanhope, aristocratic since the 13th century. If to these twenty-four peerages we add the twelve from Stewart, and the five each from Hamilton, Erskine, and Howard, we find that fifty-one of the British peers living in the year 1921 descend from ten individuals.

There are five male-lines with three branches each: Forbes, Grosvenor, Herbert, Manners, and Plunkett. Thus 66 peers spring from 15 lines. There are 42 lines which are represented by

two branches each. Thus 150 peers spring from 57 lines.

In these families we observe perpetuation through the generations, and not only perpetuation, but actual growth through ramification, increased power and increased fame. It is not easy to exactly measure all this against the reverse process which inevitably takes place, namely the decline and disappearance of some male-lines; but here at least is the other side of the shield—one story which may offset another.

We may look at it in still another way—as follows. If there were twelve men in early Scotland as powerful as the first important Stewart, and contemporary with him, and eleven of these have no aristocratic representatives today, there are on the other hand twelve peers today who can trace their lines back to only one of the original twelve. Biologically and socially one end of the chain balances the other fairly well since there are four dukes, one marquis, and four earls in the modern Stewart collection. It is true that some of these contain one illegitimate link, but that does not have any bearing on the present problem.

These facts taken from *Burke's Peerage* confirm my conclusions derived from the statistics in *Mental and Moral Heredity in Royalty*, that it remains to be proved, that the assumption of rank and power or the possession of great wealth leads to sterility or decreased fecundity from any cause. On the contrary, there are good reasons for considering aristocracy to be in many ways superior to the masses of mankind; but these reasons are derived from other data.

Here it is shown that 334 of the 622 British peers (of 1921) are continuously aristocratic in the direct male line of their family trees to as early as the year 1450. The families that did not branch are the following. Unless the title and family name are identical the title is followed by the family name. (Table I.)

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**TABLE I—List of English Peers whose Male Lines can be traced to 1450 or earlier**

Abergavenny, Nevill; Acton; Ailesbury, Brundenell Ailsa, Kennedy; Airlie, Ogilvy; Albermarle, Keppel; Allendale, Beaumont; Amherst; Arbuthnott; Arundell of Wardour; Ashburnham; Bagot; Balfour of Burley, Bruce; Bath, Thynne; Beauchamp, Lygon; Berners, Tyrwhitt; Biddulph; Brabourne, Knatchball; Bristol, Hervey; Brownlow, Cust; Byron; Cadogan; Cairns; Camoys, Stoner; Carew; Carnworth, Dalzell; Cathcart; Chetwynd; Chichester, Pelham; Clanwilliam, Meade (Maigh); Clifford of Chudleigh; Cobham, Lyttleton; Colville of Culross; Coventry; Cranworth, Gurdon; Cullen, Cokayne; D'Abernon, Vincent; Dalhousie, Ramsay; Dartmouth, Legge; De 'Lisle and Dudley, Shelley; Denbigh, Fielding; Denman; De Saumarez; De Vesci; Devon, Coventry; Digby; Dormer; Downe; Drogheda, Moore; Dunraven, Quin; Durham, Lambton; Dynevor, Rhys; Eglinton of Winton, Seton; Egmont, Perceval; Elgin, Bruce; Elibank, Murry; Elphinstone; Erne, Crichton; Esher, Brett.

Fairfax; Falkland, Cary; Falmouth, Boscawan; Farnham, Maxwell; Ferrers, Shirley; Fitzwilliam; Forester; Fortescue; Gage; Gainsborough, Hampton; Noel; Galloway, Stewart; Galway, Monckton; Garvagh, Canning; Gerard; Glasgow, Boyle; Gormanston, Preston; Gort, Vereker; Graham; Grey de Ruthyn, Clifton; Guillamore, O'Grady, Haldane; Halsbury, Gifford; Packington; Harewood, Lascelles; Hatsings, Astley; Hatherton, Littleton; Hawardden, Maude; Headley, Winn (Gwydir?); Heneage; Hereford, Devereux; Hill, de la Hull; Holm, Hamilton?; Home; Huntingdon, Hartings; Huntley, Seton; Iddesleigh, Northcote; Inchiguin, O'Brien; Kensington, Edwardes; Kenyon; Kilmorey, Needham; Kimberly, Wodehouse; Kingsale, de Courcy; Kinnaird; Kintore, Falconer; Knollys; Knutsford, Holland; Lanesborough, Butler; Lathom, Wilbraham; Lauderdale, Maitland; Leeds, Osborne; Leigh; Leith; Levan and Melville, Melville; Lilford, Powys; Lonsdale, Lowther; Lovat, Fraser.

Macdonald; Meath, Brabacon; Middleton, Willoghby; Molesworth; Monck; Moncreiff; Montrose, Graham; Mostyn, Lloyd; Mount Edgecumbe, Edgecumbe; Mowbray, Stourton; Napier; Newborough, Wynn; Newcastle, Clinton; Northampton, Compton; Northesk, Carnegie; Norton, Adderley; Onslow; Oranmore, Browne; Orford, Walpole; Perth, Drummond; Poltimore, Bamfylde; Polwarth,

### Conclusions

In conclusion I shall repeat the list of the most essential points that are necessary to a general theory of inevitable aristogenesis, or as I call it "social conification" or "national conification."

First: The opportunity for acquiring wealth of a somewhat permanent nature; Second: An opportunity for individuals who are born in the lower classes to rise to the higher classes if they happen to be endowed with exceptional ambition and ability; Third: The fact that by natural variation some children will exceed their parents; Fourth: The fact that assortative mating is strong, leading to unions of the successful with the successful; Fifth: The great strength of mental heredity; Sixth: The fact that by-and-large good qualities tend to be correlated; Seventh: That in a general way, families that once acquire high social position will stay there.

It is necessary to show that wealth and power do not as is often asserted lead to idleness, sterility and mental degeneracy. The history of the royal families shows no general degeneracy of the group as a whole. These facts, here presented for the first time, taken from the history of the British Peerage confirm the conclusions drawn from royalty. Old families do not become decrepit because of their age. The similar view, reiterated by unscientific philosophers of history, that nations like individuals become old and die is probably equally without foundation.

The present article is written chiefly in support of the last of these seven points. For the relations of the general theory of national and social conification to the rise and fall of nations the reader is referred to the following bibliography.

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7. Significant Evidence for Mental Inheritance, *Journal of Heredity*, 1917.

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Scott; Portland, Bentinck from Holland; Portsmouth, Wallop; Poulett; Powerscourt, Wingfield; Radnor, Bouverie from Flanders, Ranfurley, Knox; Reay, Mackey; Redesdale, Milford; Ribblesdale, Lister; Roden, Jocelyne; Rodney; Rollo; Romney, Marsham; Rossmore, Westenra of Holland; Roxburghe; Ruthven, Hore; St.-Davids, Phillips; St. Germans, Eliot; St. Olwald, Winn; Saltoun, Fraser; Scarbrough, Lumley; Sefton, Molyneux; Sherard; Sinclair; Somers, Cocks; Southesk, Carnegie; Southwell; Stafford, Fitzherbert; Stair, Dalrymple; Stradbroke, Rous; Strathmore, Lyon; Strathspey, Grant; Teynham, Roper; Torphichen, Sandiland; Townshend; Trunlestown, Barnewall; Veaux, Mostyn; Verulam, Grimston; Waldegrave; Waleran, Walrond; Wenlock, Lawley; Westmeath, Nugent; Willoughby de Broke, Verney; Winchester, Poulett; Wrottlesley.

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12. Successful Men Have Larger Families. *Journal of Heredity*, 1927.

13. Mental Evolution and Social Conification. *Metron—(International Review of Statistics)*, July, 1928.

14. Separating Heredity from Environment. *American Breeders' Magazine* (now called *Journal of Heredity*), Vol. II, No. 3, 1911.

**TABLE II—Families of English Peers that have more than one present-day representative. Family name and date to which the line can be traced at left**

| | |
|---|---|
| *Annesley* (Before 1450) | Annesley, Valentia |
| *Bathurst* XI Century | Bathurst, Bledesloe (?) |
| *Beresford* XI Century | Decies, Waterford |
| *Berkeley* XII Century Gloucester | Berkeley, Portman |
| *Bingham* XII Century | Clanmorris, Lucan |
| *Blair* XV Century | Dundonald, Lamington |
| *Boyle* XIII Century | Cork, Shannon |
| *Butler* XI Century, Ireland | Carrick, Dunboyne, Mountgarret, Ormunde |
| *Campbell* XI Century, Scotland | Argyll, Blythewood, Bradalbane, Cawdor |
| *Cavendish* Cir 1450, England | Chesham, Devonshire |
| *Chichester* XI Century | O'Neill, Templemere |
| *Cholmondeley* XII Century Cheshire | Pelham, De la Mere |
| *Clive* XIII Century | Powis, Plymouth |
| *Curzon* Before 1450 | Curzen, Howe |
| *Dillon* XIII Century, Ireland | Clonbrock, Dillon |
| *Douglas* XIII Century, Scotland | Hamilton, Morton, Penryn, Queensbury |
| *Dundas* Before 1450 | Melville (?), Zetland |
| *Eden* Before 1450, probably | Auckland, Henley |
| *Egerton* Probably before 1450 | Ellesmere, Wilton |
| *Eskine* XII Century, Scotland | Buchan, Erskine, Mar, Mar and Kellie, Roselyn |
| *Finch* XIII Century | Aylesford, Winchilsea |
| *Fitzgerald* Same origin as Fitzmaurice, XII Century | Fitzmaurice, Lansdowne, Leinster, Orkney |
| *Forbes* XIV Century | Forbes, Granard, Sempill |
| *Ffrench* Before 1450 | Ffrench, French |
| *Gordon* XIII Century, Scotland | Aberdeen (?), Stanmore |

**TABLE II—Continued**

| | |
|---|---|
| *Gower* XIII Century, Staffordshire | Granville, Southerland |
| *Greyville* XIV Century, Gloucestershire | Greville, Warwick |
| *Grey* XIV Century, Northumberland | Grey, Grey of Fallodon |
| *Grey* XII Century | Stamford, Walsingham |
| *Grosvenor* Before 1450 | Ebury, Stolbridge, Westminster |
| *Hamilton* XIII Century, Scotland | Abercorn, Belhaven, Boyne, Haddington, Hamilton of Dalzell |
| *Hanbury* XIII Century, Worcertershire | Bateman, Sudley |
| *Hay* XIII Century, Scotland | Kinncull, Tweedale |
| *Herbert* XII Century | Carnarvon, Pembroke, Treowen |
| *Howard* X Century, England | Carlisle, Effingham, Glossip, Norfolk, Suffolk |
| *Kerr* XIV Century, Scotland | Antrim, Lothian |
| *Lindsay* XI Century, Scotland | Crawford, Lindsay |
| *Manners* XII Century, England | Canterbury, Manners, Rutland |
| *Montagu* XI Century | Sandwich, Manchester |
| *Murry* XI Century, Perth | Atholl, Dunmore |
| *Plunkett* XIII Century, Meath | Dunsany, Fingall, Louth |
| *Ponsonby* Before 1450? | Beesborough, De Mauley |
| *Russell* Cir., 1450 | Ampthill, Bedford, De Clifford, Russell |
| *St. John* XIII Century, Oxfordshire | Bolingbroke, St. John |
| *Savile* XIII Century, Yorkshire | Mexborough, Savile? |
| *Seymour* XIII Century | Hertford, Somerset |
| *Somerset* Before 1450 | Beaufort, Raglan |
| *Stanhope* XIII Century, England | Chesterfield, Harrington, Stanhope, Weardale |
| *Stanley* XI Century, Cheshire, Lancashire | Derby, Sheffield |
| *Stewart* XI Century, Scotland | Buccleuch, Bute, Castle-Stewart, Galloway, Grafton, Montagu, Montrose, Moray, Richmond, St. Albans, Wortley, Wharncliffe |
| *Talbot* XI Century, England | Shrewsbury, Talbot |
| *Vaughn* or *Wynn* XIII Century, Wales | Lisburne, Newborough |
| *Vernon* XI Century, Oxfordshire | Harcourt, Vernon |
| *Villiers* XI Century | Clarendon, Jersey |
| *Vivian* Before 1450 | Swansea, Vivian |
| *Waldegrave* XIII Century, Suffolk | Radstock, Waldegrave |
| *Weymss* XIII Century, Scotland | Wemyss, Wester Weymss |
| *West* XIV Century, Devon | De La Warr, Sackville |

# HERITABLE CHARACTERS IN MAIZE

## XXXI—Tassel Seed-4

I. F. Phipps

TWO genetically different pistillate flowered maize plants have been described by Emerson[2] as tassel ear and tassel seed. These, in conformity with current nomenclature of heritable maize characters, are now designated as tassel seed-1 and tassel seed-2, respectively. Emerson found that tassel seed-1 is linked with the *B b* factor pair for plant color, with 20.8 per cent crossing-over, and also with the *Lg lg* factor pair for ligule-less leaf, with 45.8 per cent crossing-over. Tassel seed-2 was found to be very closely linked with the *P p* factor pair for pericarp and cob color, the crossover percentage being about 1[1].

A third type of tassel seed designated as tassel seed-3 has been studied by Professor Emerson but the data have not, as yet, been published.

A fourth type of tassel seed is reported in this paper. The original stock of seed was obtained in 1920 from the Isbell Seed Company, Jackson, Michigan, under the name of White Cap Yellow Dent.

### Description of Tassel Seed—4

The terminal inflorescence of a tassel seed-4 plant is tassel-like in general structure but it is predominantly pistillate-flowered. When the tassel emerges from the upper sheaths it appears, as pictured in Figure 1, as a huge mass of silks. The mature tassel with the silks removed is studded with kernels (Figure 2) which are usually densely packed together, especially on the central axis of the tassel, and are not arranged in regular rows. The density of the kernels on the tassel and the irregularity of the rows is due to the development of the second flower in each spikelet. The kernels are more densely packed at the tip of the central axis and branches than at the base, giving each a club-like appearance (Figure 2). The branches of the tassel are short and very similar to the central axis except that the kernels are present only on one side of the branch. The flowers at the base of the central axis and branches almost invariably produce anthers which often contain functional pollen (Figure 2). The glumes of the tassel are short, papery, and similar to the glumes of a normal ear. The glumes are short and papery even at the base of the branches where the flowers produce anthers only.

A tassel seed-4 tassel commonly carries an abundance of silks (Figure 1). A careful examination of a number of tassels revealed a few multiflowered spikelets in addition to the normal spikelets and also a few glumes which were transformed into silks. The basal part of some of the modified glumes was normal but the tip was extended into a hairless silk.

The ear of a tassel seed-4 plant also carries an excess of silks. This excess is due, partly to the development of the second flower in the spikelet, and partly to the presence of glumes which are modified into silks.

### Inheritance of Tassel Seed—4

Intercrosses between tassel seed-4 and tassel seeds-1 and -2 produced normal progeny in the $F_1$ of each cross, which indicates that tassel seed-4 is genetically different from both tassel seed-1 and tassel seed-2.*

The second generation of a cross between a tassel seed-4 plant and a normal plant was composed of 163 normal and 56 tassel seed-4 plants—an

*These data were obtained by Professor Emerson of Cornell University.

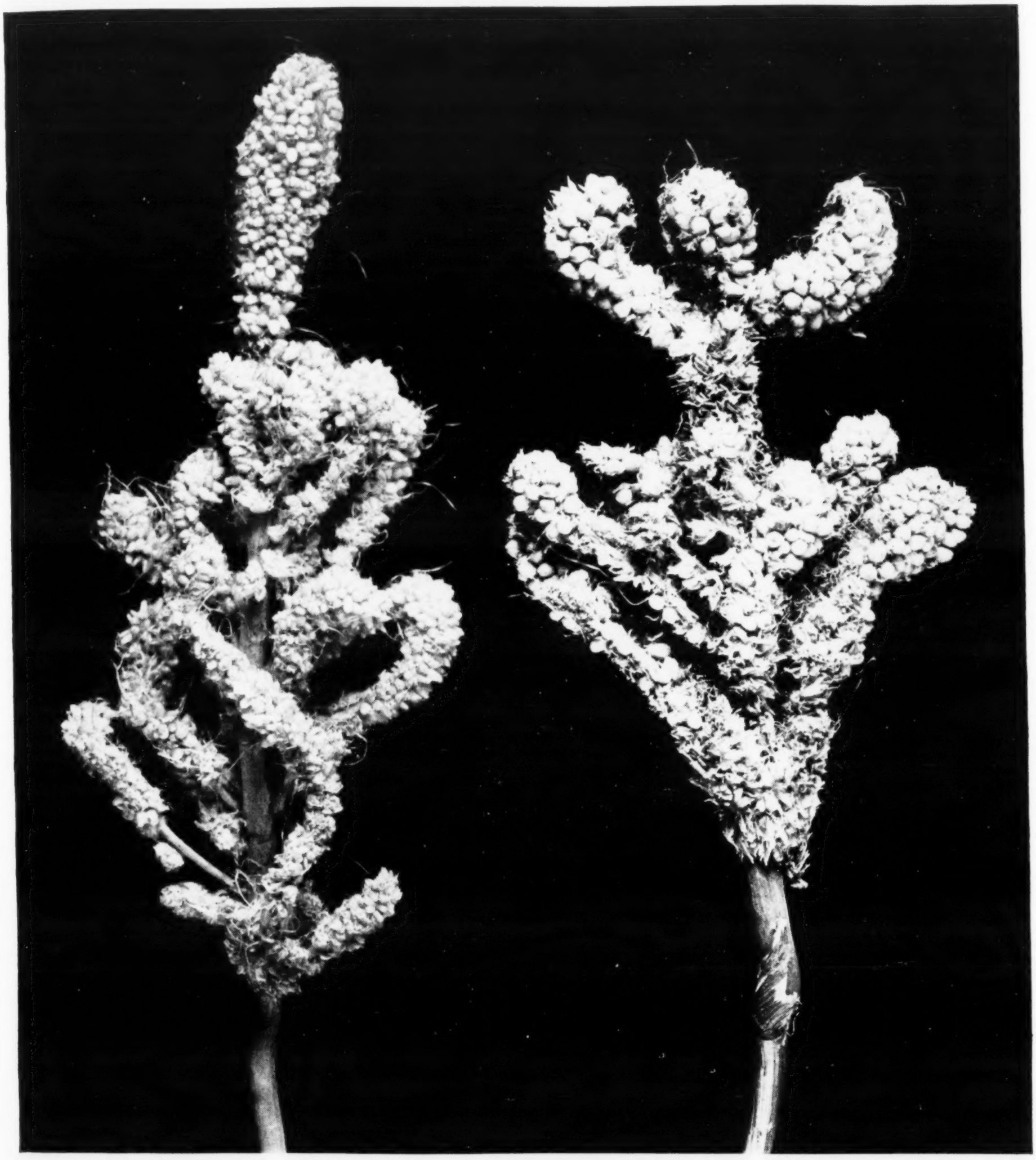


XIV Century, Devon Sackville
Stanhope Weardale
XIV Century, Scotland Lothian

**A SILK-FILLED TASSEL**

**Figure 1**

Tassel seed maize has abundant silks on the tassel, as well as on the cobs, as in ordinary maize. Three other types of tassel seed maize are known, which breeding tests show are genetically different.



## SEEDS ON THE TASSELS

**Figure 2**

The tassel-seed variation is so called because seeds are borne on the tassels. At the left is shown a tassel at time of flowering, with the silks removed. At the right is shown a mature tassel, showing the development of seeds and anthers.

**MORE SILKS THAN SEEDS**

**Figure 3**

Single spikelets and pairs of spikelets from the tassel of a tassel seed-4 plant showing the excess of silks. This is due to the fact that the second flower on the spikelet sometimes develops and to some of the glumes being transformed into silks.

almost perfect 3 : 1 ratio. Backcrosses produced 773 normal and 853 tassel seed-4 plants—a deviation of 40 plants from equality with a value of $\frac{D}{P.E}$ of 2.9. These data show that tassel seed-4 is a single Mendelian recessive to the normal and differs from the normal in a single factor pair which is designated as $Ts_4$ $ts_4$.

## Linkage Tests

Linkage tests were made between tassel seed-4 and the *Pr pr* factor pair for aleurone color, the *Y y* factor pair for endosperm color, the *B b* factor pair for plant color and the $V_2$ $v_2$ factor pair for a chlorophyll deficient seedling type known as virescent-2.

The cross *Pr* $ts_4$ · *pr* $ts_4$ × *Pr* $ts_4$ · *pr* $Ts_4$ gave 123 *Pr* $Ts_4$, 42 *Pr* $ts_4$, 144 *pr.* $Ts_4$, and 40 *pr.* $ts_4$ plants. These results when interpreted as a 3 : 1 : 3 : 1 ratio give a value for P of 0.53 which indicates independent inheritance.

The backcross *Y* $ts_4$ · *y* $Ts_4$ × *y* $ts_4$ · *y* $ts_4$ gave 121 *Y* $ts_4$ and 131 *y* $Ts_4$ as parental combinations, and 140 *Y* $Ts_4$ and 126 *y* $ts_4$ as recombinations. The parental and recombinations are not significantly different from a 1 : 1 ratio of independent inheritance, the value for $\frac{D}{P.E.}$ being less than unity.

The back cross *B* $ts_4$ · *b* $Ts_4$ × b $ts_4$ · *b* $ts_4$ gave 144 *B* $ts_4$ and 100 *b* $Ts_4$ plants as parental combinations, and 136 *B* $Ts_4$ and 128 *b* $ts_4$ as recombinations. The frequencies of the parental combinations and recombinations are not significantly different from the 1 : 1 ratio, $\frac{D}{P.E.}$ being 1.32.

The $F_2$ of the cross $V_2$ $ts_4$ · $V_2$ $ts_4$ × $v_2$ $Ts_4$ · $v_2$ $Ts_4$ gave 126 $V_2$ $Ts_4$, 27 $v_2$ $Ts_4$, 44 $V_2$ $ts_4$ and 12 $v_2$ $ts_4$. The marked deficiency of the virescent-2 classes is probably due to the death of virescent-2 plants in the field since

this family, when grown in the greenhouse, produced 70 green and 24 virescent plants. The $Ts_4$ and $ts_4$ segregates fit a 3 : 1 ratio both in the normal green and in the virescent classes thus indicating independent inheritance.

An indication of linkage was obtained from the second generation of a cross between $Ts_4$ $ts_4$ and the $A$ $a$ factor pair for anthocyanin pigment in the kernels and plant.* A large number of back crosses were made in 1926 in order to verify this indication of linkage. A summary of the data obtained from these crosses is presented in Tables I, II and III.

The coupling series (Table I) gives a deviation from a 1 : 1 ratio for parental combinations and recombinations which is on the borderline of significance, the value for $\frac{D}{P.E.}$ being 3.55. The repulsion series (Table II) gives a statistically significant deviation from a 1 : 1 ratio for parental combinations and recombinations, the value for $\frac{D}{P.E.}$ being 5.12. The combined data, coupling and repulsion series, fit an hypothesis of linkage with 44.8 per cent crossing-over.

From these data it is impossible to decide whether or not linkage exists between the $Ts_4$ $ts_4$ and the $A$ $a$ factor pairs. The data suggest linkage but the final proof will depend upon the discovery of a third gene exhibiting linkage with both the $A$ $a$ and $Ts_4$ $ts_4$ factor pairs.

## Summary


1. A fourth gene for the tassel seed type of plant has been discovered in maize and designated $ts_4$.
2. Tassel seed-4 behaves as a simple Mendelian recessive to the normal maize plant.
3. Linkage tests indicate that $Ts_4$ $ts_4$ is probably inherited independently of the $Pr$ $pr$, $Y$ $y$, $B$ $b$ and $V_2$ $v_2$ factor pairs.
4. A slight indication of linkage exists between $Ts_4$ $ts_4$ and the $A$ $a$ factor pair for Anthocyanin pigment but the evidence is not conclusive. The data fit an hypothesis of 44.8 per cent crossing-over.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*Through the kindness of Professor Emerson this material came into the possession of the writer for the purpose of enabling him to study further this indication of linkage and of testing the possibility of linkage between $Ts_4$ $ts_4$ and $V_2$ $v_2$, since $V_2$ $v_2$ has been reported[3] to be loosely linked with $Aa$, a conclusion which the writer has not been able to confirm.

**Tables on Next Page**

Table I.

$\frac{A}{-}\ \frac{Ts}{-}_4 \cdot \frac{a}{-}\ \frac{ts}{-}_4 \times \frac{a}{-}\ \frac{ts}{-}_4 \cdot \frac{a}{-}\ \frac{ts}{-}_4$

| Family | Parental combinations | | Recombinations | | n | D / P.E. | Per cent cross-overs |
|---|---|---|---|---|---|---|---|
| | $\frac{A}{-}\ \frac{Ts}{-}_4$ | $\frac{a}{-}\ \frac{ts}{-}_4$ | $\frac{a}{-}\ \frac{Ts}{-}_4$ | $\frac{A}{-}\ \frac{ts}{-}_4$ | | | |
| 2860 | 42 | 40 | 42 | 32 | | | |
| 2862 | 48 | 45 | 28 | 31 | | | |
| Total | 90 | 85 | 70 | 63 | | | |
| observed | 175 | | 133 | | 308 | | |
| Calculated (1 : 1 ratio) | 154 | | 154 | | 308 | 3.55 | 43.2 |

Table II.

$\frac{a}{-}\ \frac{Ts}{-}_4 \cdot \frac{A}{-}\ \frac{ts}{-}_4 \times \frac{a}{-}\ \frac{ts}{-}_4 \cdot \frac{a}{-}\ \frac{ts}{-}_4$

| Family | Parental combinations | | Recombinations | | n | D / P.E. | Per cent cross-overs |
|---|---|---|---|---|---|---|---|
| | $\frac{A}{-}\ \frac{ts}{-}_4$ | $\frac{a}{-}\ \frac{Ts}{-}_4$ | $\frac{A}{-}\ \frac{Ts}{-}_4$ | $\frac{a}{-}\ \frac{ts}{-}_4$ | | | |
| Total of families 2681 and 2682-2873 | 351 | 372 | 262 | 333 | | | |
| Observed | 723 | | 595 | | 1318 | | |
| Calculated (1 : 1 ratio) | 659 | | 659 | | 1318 | 5.12 | 45.1 |

Table III.

Total parental and recombinations classes in coupling and repulsion series (Tables I and II).

| Series | Parental combinations | Recombinations | n | D / P.E. | Per cent cross-overs |
|---|---|---|---|---|---|
| Coupling | 175 | 133 | | | |
| Repulsion | 723 | 595 | | | |
| Total observed | 898 | 728 | 1626 | | |
| Calculated (1 : 1 ratio) | 813 | 813 | 1626 | 6.25 | 44.8 |

# EUGENIC STERILIZATION IN CALIFORNIA

## 14. The Number of Persons Needing Sterilization

PAUL POPENOE

*Pasadena, California*

THE proposal of eugenic sterilization is based on the fact that there are certain persons in the community whose children would be a liability rather than an asset to future generations, because of their inherited natures. The question, How many persons are there in the community who might produce eugenically undesirable children, is therefore fundamental to any discussion of the subject, and was taken into account in a comprehensive study of the workings of the California sterilization law, which has been under way for more than two years past*, financed and directed by E. S. Gosney, a Pasadena philanthropist, with the cooperation of an advisory committee made up of recognized authorities in many different lines of activity.

While a decision as to sterilization must be made in every instance on the basis of the individual's own characteristics and history, and not because of supposed membership in any arbitrarily defined class or group, it is convenient to discuss the problem at this stage on the basis of certain large groups in the community. The one that comes first to mind, in most discussions of this sort, is made up of persons who are intellectually deficient.

### The Mental Defectives

Standard mental tests, which furnish a rough-and-ready measurement of "general intelligence", are usually interpreted in terms of the Intelligence Quotient (IQ), or the ratio of the chronological age to the mental age. The average or "normal" is 100, and the line below which anyone is usually considered to be seriously deficient mentally is customarily set at 75 IQ or 70 IQ.

The Department of Psychology and Research of the Los Angeles public schools has within the last few years made complete surveys of 219 elementary schools, including 80,988 children, approximately one-half of the total enrollment of the city. Various group tests were used for this purpose, but principally the National Intelligence Test.

Through the courtesy of Dr. Elizabeth Woods, director of the department, we were given the mentality records of these pupils. Those who fell below 70 IQ made up 4.35 per cent of the total. To this must be added the unknown number of defectives who do not get into the schools. The Nassau County (N. Y.) Survey[1] found that one-third of the defective children of the community were not in school: they were kept at home either because of their deficiency or because under school age. Probably 5%, therefore, would be a conservative estimate of the total.

This high figure must be interpreted in the light of several facts.

1. It is based on group tests. Many children would have made slightly higher scores on individual tests.

2. It is made up by averaging the results of various tests, a procedure which is not statistically orthodox. It is believed, however, that the error introduced in this way is small.

3. It includes some Negro and many Mexican children, and both of these

*A list of the papers previously published in this series will be sent on application to E. S. Gosney, 26 North Marengo Avenue, Pasadena.

groups have been found in California to rank well below the whites in intellect. However, they are part of the population, and can not be omitted. The language handicap introduced a disturbing element of unknown size.

4. It is not known to what extent the schools surveyed are representative. They might include the worst rather than the best children of the city. They are widely scattered geographically, and there appears to be no ascertainable bias from this point of view. Those in charge of the work believe that the survey is representative of the city as a whole. The number of pupils concerned in it (80,988) is so large as to carry a good deal of weight, and the result is surprisingly close to that found in a survey of X County, California, in 1917, made by quite different methods and depending on individual tests (the Standard Binet)[2]. This showed 4.24% of the school children to be below 70 IQ. In X County there were many children of Spanish and Portuguese descent in the rural schools, who swelled the total of defectives; but they can not be omitted in the present study, for they are found in large numbers in the state home for the feeble-minded[3]; hence their presence in the state is highly significant eugenically.

Recent figures of the same sort reported from other parts of the country disclose some variation. In a study[4] of 6,000 white children in the primary schools of Kansas City, Mo., 1.19% were found to be below 65 IQ and 3.0% between 65 and 75. Another study[5] bringing together data from a number of different states, and including some high school as well as elementary school pupils, 4330 altogether, found 5.4% to be below 70 IQ. A survey of all the schools in eight Minnesota towns, comprising 5974 pupils[6], yielded 4.7% under 75 IQ. In all these cases, it must not be forgotten that some of the defectives were not in the schools, but were at home, therefore not counted. A consideration of all these results suggests that the figure found in Los Angeles is reasonable.*

### The Army Tests

The largest test made on a group of adults is that of the U. S. draft army[7]. Unfortunately, separate data for California were not published. If the figures for the entire country are transmuted[8] to a basis comparable with those that have just been given, 6.2% of the drafted men were found to have an IQ of less than 70.

The significance of the draft figures has been debated warmly for years. The most defective were excluded at home, thus raising the average. On the other hand, many of the superior were excluded by exemptions for industrial reasons or because married, thus lowering the average. The exact effect of these exclusions at the two ends of the scale is a matter of opinion, since there is no definite evidence. Many students think that they would balance each other, so that the draft army may be taken as fairly representative of the entire male American population. The effect of group tests is also controversial; but it was checked by giving individual tests to a large group. In any case, the mere size of the group—two million men—gives the figures great weight.

The army figures at least suggest that the school figures above mentioned do not exaggerate the situation for the entire population. If the foreign-born and Negro populations were sampled more adequately, the amount of deficiency might be found to be still higher. While no two states, and no

*It also suggests that the standardization of the Stanford Binet scale, which assigned only 1% of the population below 70 IQ, and less than 3% below 75 IQ, was somewhat too high, even for white children. The studies mentioned above were mostly made with various group tests, and the children would probably have scored a little higher on the Stanford Binet, but not enough to make up the discrepancy between 1% and 4% or 5%.

two counties, are alike in this respect, it seems conservative to say that probably 4% of the total population of the United States is mentally deficient by this technical and arbitrary standard.

If so, California has at least 200,000 mentally deficient inhabitants, the entire United States 4,800,000. As compared with this estimate, the number[9] in custodial care in both public and private institutions in California does not exceed 3500, and in the institutions[10] of the whole United States 60,000.

### Significance of the IQ

It is not to be assumed that all individuals testing below IQ 70 are subject to compulsory sterilization. The amount of mental deficiency indicated does not necessarily make an individual "feebleminded" in the social sense, although anyone with that amount of deficiency has in the past often been called feebleminded. If the term feeblemindedness has any useful meaning at all, it refers to inability to get along successfully in the world on one's own responsibility under ordinary circumstances; and by this standard many individuals with IQ below 70, some even with IQ considerably below 60, may not be feebleminded.

Those who get into difficulties are for the most part the emotionally unstable, as we have pointed out elsewhere[11]. It may be, in fact, the higher rather than the lower levels of mental defect that produce the most persons who satisfy the social definition of feeblemindedness; although anyone with an IQ below 70 is an asset of doubtful value to racial progress.

This dividing line is based rather on educational achievement, and there is abundant evidence that an individual below it is rarely able to get by his own merits beyond the fifth or sixth grade. This group, therefore, furnishes a large part of the unskilled labor of the nation, and is composed mainly of inoffensive, law-abiding, useful citizens. Even though they might profitably be replaced by others of greater inteliigence, no community would attempt to sterilize at the present time merely on the basis of an IQ below 70.

Not all this mental deficiency is hereditary. Few students place the amount of it due to inheritance at less than 50%; many consider it 75% or more. We are not concerned just now to examine this point. There are some cases in which all will agree the defect is inherited and will be transmitted to posterity. There is, unfortunately, no lack of instances such as that which led the United States Supreme Court to uphold the constitutionality of eugenic sterilization in 1927, and which caused Justice Oliver Wendell Holmes to say in his decision, "Three generations of imbeciles are enough." It will be a sound procedure to start with these unquestioned cases and leave extensions to the future, as the advance of science warrants—unless society decides that it is not good policy to have even normal children brought up by feebleminded parents, in which case there might be reason for discouraging parenthood in a larger group. Application of eugenic sterilization in the future will undoubtedly be on a much deeper foundation than is now in existence, but this is no argument against making an inteliigent and conservative beginning at once.

If it were to be said that 1% of the total population might properly be denied reproduction because of mental deficiency, this would mean 50,000 in California, 1,200,000 in the United States as a whole.*

### The Mentally Diseased

The next large group is that of the mentally diseased or so-called insane. There were under treatment and care in the state institutions of California[12] during the year ending June 30, 1926,

*For the sake of simplicity it is assumed throughout this discussion that the population of the United States is 120,000,000, and that of California 5,000,000.

in this group 16,788 patients. The private institutions licensed by the state[13] have a capacity of 1606. It is not known how fast their population changes, but the total of the two is 18,394, and might run up to 20,000 if the turnover in the private institutions is rapid.

In the institutions of the United States[14] (public and private) for the year ending January 1, 1923, there were on the books 290,456 patients, with an additional 2,052 in almshouses. The number at the present time can not be less than 300,000. Some of these patients will never leave alive, but of those that will recover at least temporarily, many stay less than one year, hence the population of the institutions is an ever-changing one. From the average length of stay and the average length of life of these patients, it is possible to make a rough calculation of how many persons in the United States have been or at some time in their lives will be inmates of an institution for mental diseases. It appears[15] that the correct figure must be about 4%. This means 4,800,000 for the United States as a whole, and 200,000 for California alone on the same ratio. The actual number for California would doubtless be larger, as the state receives annually many unstable adults from other states. And in all states it will be understood that there are many individuals who do not get into institutions, although their mental condition may be just as bad as or worse than that of those who are committed because their families can not afford to keep them at home, or for some similar reason.

This is not the place to discuss critically the amount of mental disease that is hereditary. Careful studies agree in showing that at least one-half of the patients who get into psychopathic hospitals have a family history of mental disease[16]. In many of these cases it is inherited; in many other cases where there is no ascertainable family history it is also inherited.

Here again it is not our intention to argue that half of all insanity is hereditary, or to insist on any particular figure. No one denies that in some cases the constitutional basis for mental disease is such a predominant factor as to handicap severely the children of the individual in question. If the individual is of child-producing age and likely to marry, or if married is likely to be unable to control reproduction, there should be no objection to sterilization. And with nearly five million individuals to choose from, even on the most conservative basis, there would be enough sterilizations to keep the hospitals of the United States busy for a long time to come.

The number of new admissions to the hospitals each year is not less[17] than 75,000. In California about one new admission in five is being sterilized at the present time. If the rest of the United States did only half as much, or one new admission in 10, there would be 7500 sterilizations a year, and of the 4,800,000 members of the population who have been or are going to be patients in a mental hospital at some time during their lives, 480,000 would have their reproductive capacities terminated.

Leaving the eugenic requirements out of the question altogether for the moment, many mental hygienists are coming to think that continued childbearing for a mother who is mentally unstable and for whom each pregnancy perhaps means the precipitation of a psychosis and a year in a hospital, is not to the interest either of that mother, or of her children.

In these two groups of persons who are or at some time will be incapacitated mentally, either by disease or by deficiency, there must be about 400,000 individuals in the state of California. The corresponding number in the United States must be nearly 10,000,000. The overlapping of the two groups is not great. If sterilization is to be regarded as one method among many for dealing with this problem,

it is evident that, even with the soundest and most conservative approach, there would be no lack of cases as to which every informed person would agree. It would not be necessary to include any borderline cases; any cases in which there was room for a reasonable doubt; any cases in which the family opposed sterilization and were willing and able effectively to assume responsibility for controlling the situation themselves.

### Physical Defects

While these are the only groups now included or likely in the near future to be included in laws for compulsory eugenic sterilization, they are not the only groups whose offspring might be handicapped by inherited defect. There are several smaller and rather well defined groups that require consideration at once.

The blind, for instance, number[18] some 75,000; the deaf[19] some 100,000. While most of them owe their condition to infectious disease or accident, eugenists usually agree that at least 10% to 20% are handicapped because of heredity which will in turn affect the descendants. If they are to marry, as many of them may properly do, sterilization may be sought. The group of the crippled is much larger, some estimates putting the number as high as 700,000, but most of these represent accidents. There are, however, a number of well-known inherited defects which result in crippling, and as the mode of transmission of many of these has been worked out, they furnish at least a few probable candidates for voluntary sterilization.

Finally, there are the immense groups which now contribute most of the patients who are sterilized in private practice in California: those with bad hearts, lungs, kidneys; with cancer; or in some other way so handicapped that another pregnancy may cause the death of the woman.

It is estimated[20] that about 300,000 persons are now affected with cancer in the United States, that the number who die annually in the continental United States every year from cancer is about 100,000, and that of the adult population about one in 10 will eventually die of cancer. As this affection has a definitely hereditary basis[21], here is another large group in whom the question of the limitation of offspring may arise occasionally. It is conceivable, for instance, that in certain cases where two persons of highly cancerous strains marry, they might think sterilization desirable. At present, compulsory sterilization is not in question for this group.

Nearly half a million persons die in the United States every year from the degenerative diseases that affect the heart, arteries, and kidneys. In most instances where one of these affections leads to the sterilization of a woman, the purpose is to protect her rather than to protect society. But whatever the reasons advanced, these groups furnish a certain number of persons each year who are voluntarily seeking sterilization.

Our impression is that more women are sterilized privately and voluntarily in California as the result of tuberculosis than as the result of any other one cause. We shall deal fully with the subject in future papers. Here again the purpose is ordinarily therapeutic rather than eugenic—to save a woman's life rather than to cut off a strain of defective germ-plasm. It is well known that virtually every adult has been infected with tuberculosis at some time in early life, although nine out of ten die of something else.

The present essay makes no attempt to draw any specific conclusions or to lay down any regulations. Its purpose is only to point out that the classes of people, to some of whom sterilization may be a matter of importance for one reason or another, number their members not in the thousands, not in the hundreds of thou sands, but in the millions. It goes without saying that no system of steri-

lization, either compulsory or voluntary, could apply to more than a small fraction of this number. It is also true, however, that certain large classes already come within the scope of compulsory sterilization under the laws of California (and many other states), and that certain still larger classes are furnishing each year an increasing number of candidates for voluntary sterilization. It is high time for the people of the United States as a whole to take account of these two situations, and to be prepared to deal with them firmly and effectively in such a way as will best protect their own interests.

## Summary

1. The number of persons in the United States with an intelligence quotient of less than 70, and therefore seriously deficient in intellect, appears to be not less than 4%.

2. About 4% of the population will also be patients at some time during life of a hospital for mental diseases. Others equally in need of such hospitalization will not receive it, but their unknown number should be added to the 4% mentioned in taking a national inventory of the amount of damaged germ-plasm.

3. When these two groups, the mentally deficient and the mentally diseased, are added together (there is not much overlapping), the total number of persons who are definitely subject to mental diseases of a serious nature or are intellectually retarded to a serious degree must be nearly 10,000,000.

4. Many of this number owe their condition to heredity, and the question of eugenic sterilization may, therefore, arise in connection with them at some time.

5. The number of persons carrying inheritable physical defects or dispositions of a serious nature is even larger than that carrying the more severe forms of mental abnormalities. In the number are the small groups of blind, deaf, crippled, and the like, and the large groups characterized by degenerative conditions of the heart, arteries, or kidneys, and by such diseases as tuberculosis and cancer.

6. While the groups with mental defects furnish all the cases of compulsory sterilization, the groups with physical defects appear to furnish most of the cases of voluntary sterilization in California.

7. In view of the great numbers of affected persons, it is concluded that the state must take an immediate and active interest in voluntary as well as in compulsory sterilization.

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Angeles school children have shown that their average is 100 IQ. The two groups can therefore be compared fairly: 6.2% of the draft was just as far below the average as 4.35% of the Los Angeles school children are below the average.

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## Cells and Crystals

H. Przibram, Die anorganischen Grenzgebiete der Biologie (insbesondere der Kristallvergleich). Gebrüder Borntraeger, Berlin, 1926. 65 figures. 7.50 marks.

The author of this book is director of the Institute for Experimental Biology in Vienna. For many years he has been interested in the question whether analogies can be drawn between the properties of crystals and the laws governing organisms. He now presents a digest of these questions with particular reference to the problems of growth, differentiation of form and shape, and regeneration in crystals and in living organisms. It must be granted that in many cases the analogies are very striking, and there is no reason to doubt that fundamental physical and physico-chemical laws are partially responsible for the similarities in inorganic and organic processes. The inadequacy of our knowledge concerning the dynamics of living matter naturally does not permit us to establish the extent to which common causes determine these analogies. In his stimulating presentation Przibram makes the reader realize page after page how little we know about the fundamental properties of living matter.

*W. L.*

Figure 4

## A MULE COLT FROM NEBRASKA

The mother mule appears at the extreme left

Lawrence, Kansas.
November 28, 1927.

*Journal of Heredity,*
*Washington, D. C.*

I hand you herewith three photographs of what is said to be a mother mule and her young foal sired by a jack. They come to me from a personal friend, Mr. W. J. Madden, of Hays, Kansas, a college graduate and extensive livestock breeder and business man, well known in his community. Recently Mr. Madden was in Hastings, Nebraska, and formed the acquaintance of a local stock raiser by the name of Watt, initials not supplied me. Mr. Watt told him that this was a sure-enough foal of the mare mule, and that she was bred back to the same jack and believed to be again in foal.

Thinking that this might interest your readers I am sending the pictures along with this brief explanation. I have shown them to Prof. H. H. Lane, of the University of Kansas, and requested him to take the matter up for further investigation provided he thought the matter of sufficient interest to justify him in doing so. He expressed a desire to look into the matter further, which I understand he will do as early as he can in a proper manner.

Yours very truly,
(Signed) ERASMUS HAWORTH.

# A FERTILE MARE MULE

A. H. Groth

*A. and M. College of Texas*

**A MULE FAMILY**

**Figure 5**

The mule family shortly after the horse-like colt was born. The mule at the right is the first colt of "Old Beck," which was born before she was brought to Texas A. and M. College. Its sire was a jack; the sire of the horse-like colt was a stallion.

THE mule is generally accused of having no pride of ancestry nor hope of posterity. So far no mule has been found to cause the first offense to be doubted, but in "Old Beck," an ancient mare mule owned by the A. & M. College of Texas there is at least one mule that has caused some doubt as to the lack of hope of posterity.

In June, 1920, an article entitled "Days of Miracles" appeared in *The Farm and Ranch*, a weekly farm journal published in Dallas, Texas. This article was signed by Mr. L. T. Branham of Montalba, Texas and told of a mare mule giving birth to a live female offspring sired by a jack. A picture of the mare mule and her foal accompanied the article.

A few weeks later Professor W. L. Stangel, at that time connected with the Animal Husbandry Department of the A.& M. College of Texas, visited Mr. Branham. Professor Stangel arranged for the loan of the mare mule and colt to the college and at the same time secured affidavits from the owner and his neighbors certifying to the birth of the colt.

"Old Beck" and her daughter ar-

**"OLD BECK" AND HER SECOND COLT**

**Figure 6**

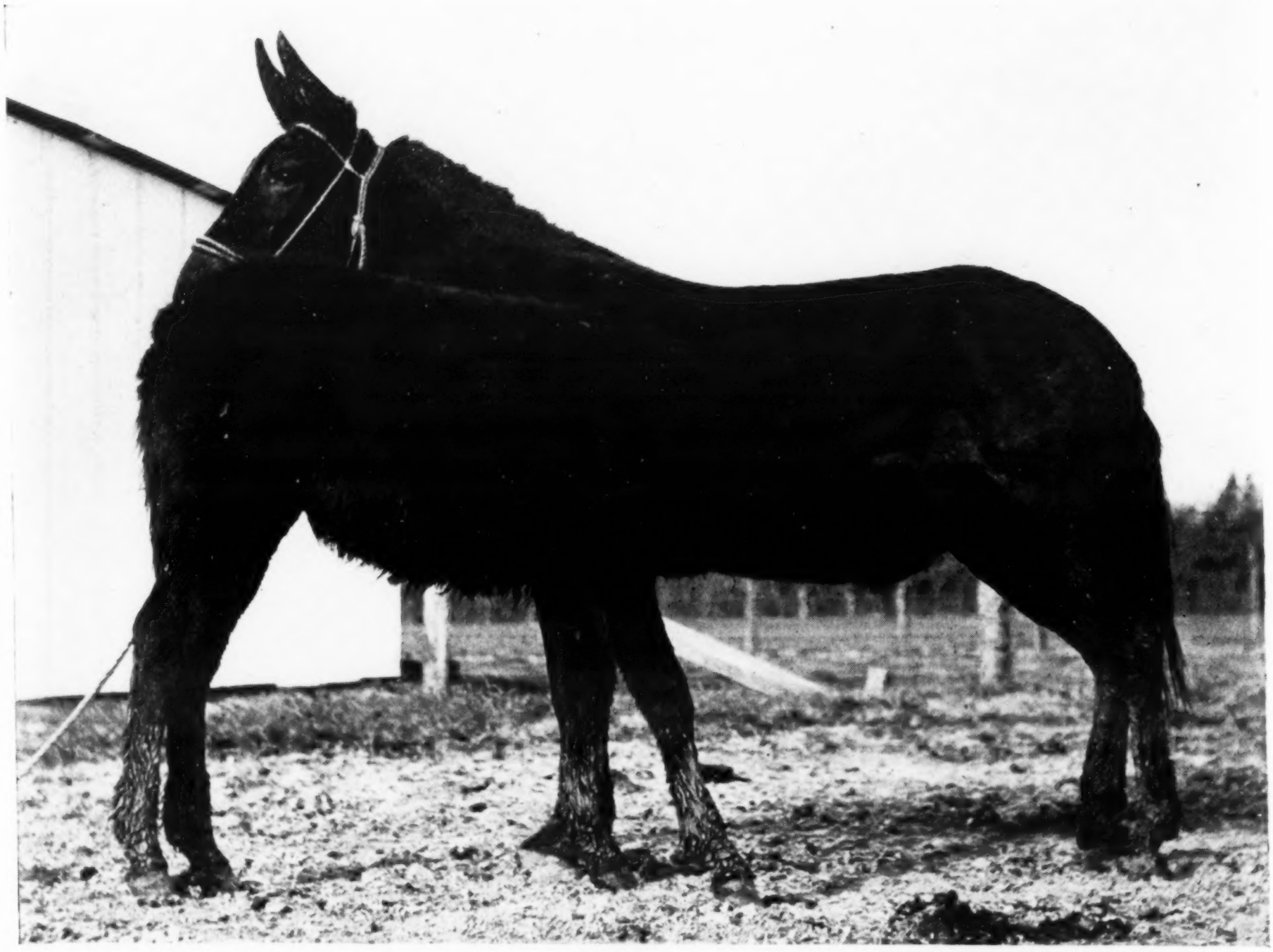
Nobody who has seen her questions "Old Beck's" being a mule, in spite of her two colts. A sample of her blood reacted to test exactly like that of other mules, which strengthens the evidence that she is neither a Jennet or a hinny.

rived at College Station, Texas on August 11, 1921. She was found to be a very ordinary bay mule that would be classed as a cotton mule. There was nothing about her appearance to attract attention for there are thousands of mules like her helping the Texas farmers cultivate their crops. She weighed 850 pounds and stood 13.2 hands. At that time her age was given as twenty-one years.

The colt was a dark bay in color and gave promise of developing into a larger individual than her dam. All of her characteristics were those of a mule and she did not show any more characteristics of her sire than does an average mule.

"Old Beck" was mated to a jack in August 1921 and rebred in September. She failed to foal in 1922. On October 25, 1922 she was bred to the bay saddle stallion, Pat Murphy, and on September 26, 1923 foaled a living stallion colt. This colt is bay in color with a white star and three white feet as shown by the picture. He had all of the characteristics of his sire except that his left ear drooped and the left side of his forehead lacked the fullness of the right side.

At the time of service Pat Murphy



**THE MULE-LIKE COLT**

**Figure 7**

The mule-like colt has developed into a dark bay mule, showing no more characters of her sire than an ordinary mule.

was nineteen years old and at the time of foaling "Old Beck" was twenty-two. The colt was born in the pasture of the Animal Husbandry Department and was seen by the members of the department within thirty minutes of the time it arrived. Its hair was not yet dry. Other members of the college staff who saw the colt at that time were Dr. Mark Francis, Dean of Veterinary Medicine, Dr. R. P. Marstellar, of the Veterinary School, and Dean E. J. Kyle, Dean of Agriculture.

"Old Beck" was not rebred until the following March when she was mated to a jack. On December 24, 1924 she aborted an abnormal foetus. It had but one eye, that in the center of the forehead, and the upper jaw was entirely undeveloped. Members of the Veterinary Staff declared that it could not have lived even though it had been carried the full gestation period.

During 1923 Pat Murphy died so in the spring of 1925 Beck was again mated with the jack but she has failed to settle even though rebred at regular intervals. The older colt has been mated at various times with stallions and jacks and also with her half brother, but has never conceived.

In July 1925 Pat Murphy Jr., the colt by the stallion, served one mare but she failed to settle. No more mares were bred to him that year. During March, 1926, two more mares were bred to him and on February 14, 1927 one of them foaled a perfectly formed bay stud foal. It is not known whether or not the other mare settled for she was never returned for trial. This year

THE HORSE-LIKE COLT AT TWO YEARS OF AGE

**Figure 8**

"Old Beck's" second colt has grown into a well developed horse of remarkable intelligence. About the only mule characteristic he displays is a dislike for crossing streams and ditches.

several mares were bred and a closer check will be made on them.

This horse has developed into a nicely balanced horse of saddle type. He is 14 hands in height and weighs 980 pounds. He performs well under saddle and is possessed of remarkable intelligence. The only mule characteristic which he shows is his dislike for crossing a ditch or a stream.

Many people who have not seen "Old Beck" have been doubtful as to whether or not she really is a mule, but was rather a jennet or a hinny. No one who has seen her has doubted her being a mule. In order to gain all possible knowledge as to the species of "Old Beck" and her family, samples of their blood was sent to the Rockefeller Institute for Medical Research, New York City.

Dr. K. Landsteiner of the Institute, who examined the samples reported as follows: "I have examined the three samples of blood sent by you, according to the method outlined in my paper in the *Journal of Immunology*, Volume 9, Page 213. It was found that the samples marked "Beck" and "Kate" reacted exactly like the blood of mules. The sample marked "Pat" seems to behave differently from the other two. I should, however, not like to make a definite statement as to the sample before a more extensive study has been undertaken. I may be able to make such a study at a future date."

Signed

(Signed) K. LANDSTEINER.

Since "Old Beck's" case has come to light, several others have been reported but no definite proof has been available concerning any of them.

# FIG BREEDING

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IN his account of fruit breeding published in this Journal last year, Darrow did not make mention of any work having been done with seedling figs either by the United States Department of Agriculture or by the State Experiment Stations. Since the California Station is carrying on a rather extensive project in fig breeding, it seems desirable to set forth the objectives in mind and to summarize some of the attempts made in the past to develop better fig varieties.

It is evident, from a review of the literature available, that little systematic work in fig breeding has been carried on in Europe. In the Mediterranean fig districts of North Africa, Southern Europe, and Eastern Asia, fig seedlings spring up in all sorts of unexpected places, the seeds having been scattered by man, bird and beast. The varieties of figs grown in gardens or in commercial orchards seem to be the result of chance pollinations rather than of any controlled or prearranged crosses. Although the best of these varieties have been grown commercially for decades not only in the Old World, but in California, there is need for better varieties. In Italy, for instance, Pellicano refers to the Dottato as a decadent variety, and suggests developing new seedling figs resistant to diseases. Guglielmi also suggests that Italian growers plant large numbers of Dottato seed and choose improved varieties from the seedlings. In 1911 F. de Rosa mentioned a seedling bearing conspicuous black figs, but not of such quality as to merit propagation.

In the vicinity of Fontaine de Vaucluse, France, L. Du Sablon found about a hundred fig trees undoubtedly sprung from seed. Of these a fourth or a third were male fig trees, the remaining female trees all producing fertile seeds. On the borders of the Ardeche, not far from its confluence with the Rhône, he located a smaller number of fig trees, probably seedlings, in which the proportion of male trees was about the same.

Probably the most carefully planned work in fig breeding in the Mediterranean districts, has been that of Dr. Trabut at Algiers. He has investigated the probable origin of *Ficus carica* and has concluded that this species is a hybrid between several closely related species such as *F. palmata, F. pseudocarica, F. persica,* and *F. virgata.* In 1922 he had two of these species under cultivation, *F. palmata* and *F. pseudocarica,* and had distributed fertile seeds obtained by crossing pistillate flowers of each species with pollen of *F. carica.* At the Montpelier plant garden he had numerous seedlings from these crosses under observation, but no subsequent report on their behavior has been noticed.

The introduction of the common fig into the United States was undoubtedly by means of cuttings, although grapes, oranges, dates, and probably olives were grown from seed. Parthenocarpic varieties of figs were the first to be grown and it was not until the introduction of the Blastophaga in 1899 that fertile fig seeds were available from American-grown fruit. Early experimenters in fig breeding had therefore to resort to the use of fertile seeds washed from imported figs mainly of the Smyrna type. Thus we learn that Rev. Robert Jope, who was engaged extensively in fig culture at Indianola, Texas, succeeded as early as 1875 in obtaining

several hundred plants from seed washed from dried Smyrna figs.*

Unfortunately early fig breeders, such as Rev. Jope, were doomed to disappointment from the start, since Smyrna fig seedlings invariably prove to be either caprifigs, which are worthless unless used for caprification, or figs of the Smyrna type, which produce edible fruit only when caprified. The existence of numerous large, thrifty shade trees of both caprifig and Smyrna type throughout the southern states is a reminder of the zeal of these experimenters in this line of horticulture.

In North Carolina, Massey planted fertile seeds of dried figs in order to test the possibility of producing parthenocarpic varieties from Smyrna seedlings. In 1903 he reported that he had grown hundreds of seedlings from the imported figs, but that their fruit failed to set in the absence of the Blastophaga. A few years later Reimer reported that the premature dropping of figs was due, in about ninety-five per cent of the cases, to the fact that the fruit was produced by chance Smyrna seedlings. Most of these were of the caprifig type.

In his book entitled *Fig Culture*, Van Velzer states that fig seeds generally produce wild figs which are worthless. "Seeds have been planted in large beds, some horticulturists using a pint at once, and usually but one or two promising trees have resulted in each case."

One of the most enthusiastic breeders of figs in the southern states is B. W. Hunt, of Eatonton, Georgia. About twenty years ago he made some fig crosses by cutting into the fruit and introducing pollen through the cut on the point of a knife blade, using Brown Turkey, Green Ischia, and Celestial figs for the female parent. Subsequently he received caprifigs with living Blastophaga which effected pollination of the common figs available. One of his main objectives was to produce a fig with a peduncle long enough to turn over or down, and thus shed rain away from the eye. Another was to develop fig seedlings more resistant to winter frosts. Seedlings of common figs proved to be remarkably vigorous and rapid in growth, compared to seedlings of the true Smyrna figs.

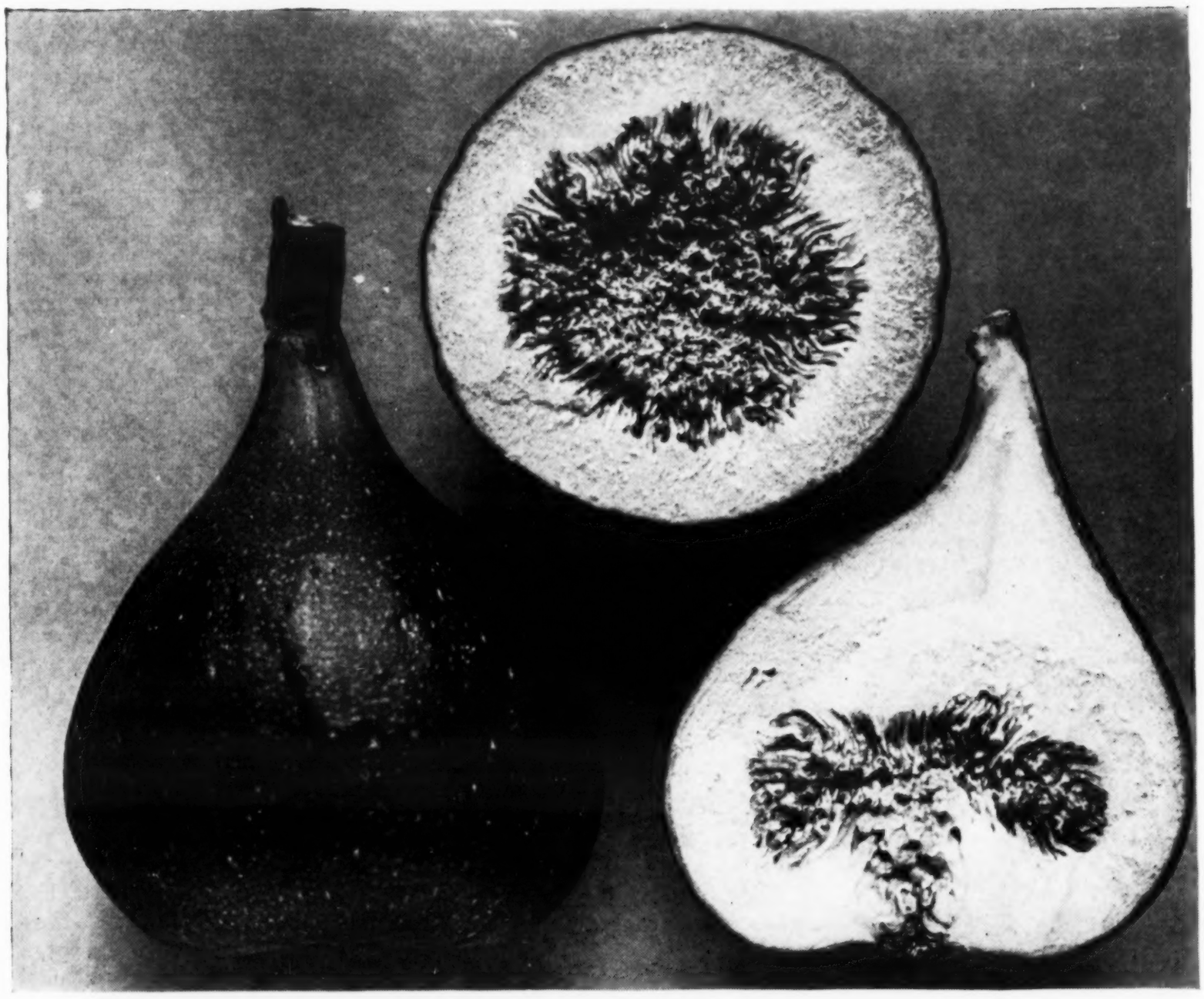
According to a letter recently received from Mr. Hunt, his most successful fig seedling has resulted from White Ischia crossed with pollen of caprifigs furnished by the United States Department of Agriculture. This fig, the Hunt, is larger and of better quality than the Celestial, but too tender to ship well as a fresh fruit.

Dr. Gustav Eisen stated in 1901 that the majority of fig seedlings give fruits with male flowers. Of the Smyrna fig seedlings which he raised, some produced fruits with purely female flowers, while others bore fruits containing male flowers in various proportions. According to him, "no edible variety of the common fig has been originated in California, and any statements of valuable varieties having been raised from seed in hothouses in England or elsewhere in Europe should be accepted with doubt."

The growing of seedling figs in California was first stimulated by the attempts to produce true Smyrna figs and by the discussions over the necessity of caprification for this type of fig. In order to prove the latter point and to establish the identity of the Smyrna fig, E. W. Maslin obtained some seeds of the imported Smyrna fig first from San Francisco and later from New York, raised seedlings, and planted them in orchard form at Loomis in 1887. The fruit appearing on the seedlings all dropped on account of lack of caprification until the Blastophaga was introduced in 1901. It was then found that of the 139 seedlings, 74 were of the caprifig type and 65 of the Smyrna type.

Dr. W. T. Swingle stated in 1908 at the Thirty-fourth Fruit Growers'

*Reference from Scrapbook Vol. 2, p. 21, of G. P. Rixford, San Francisco



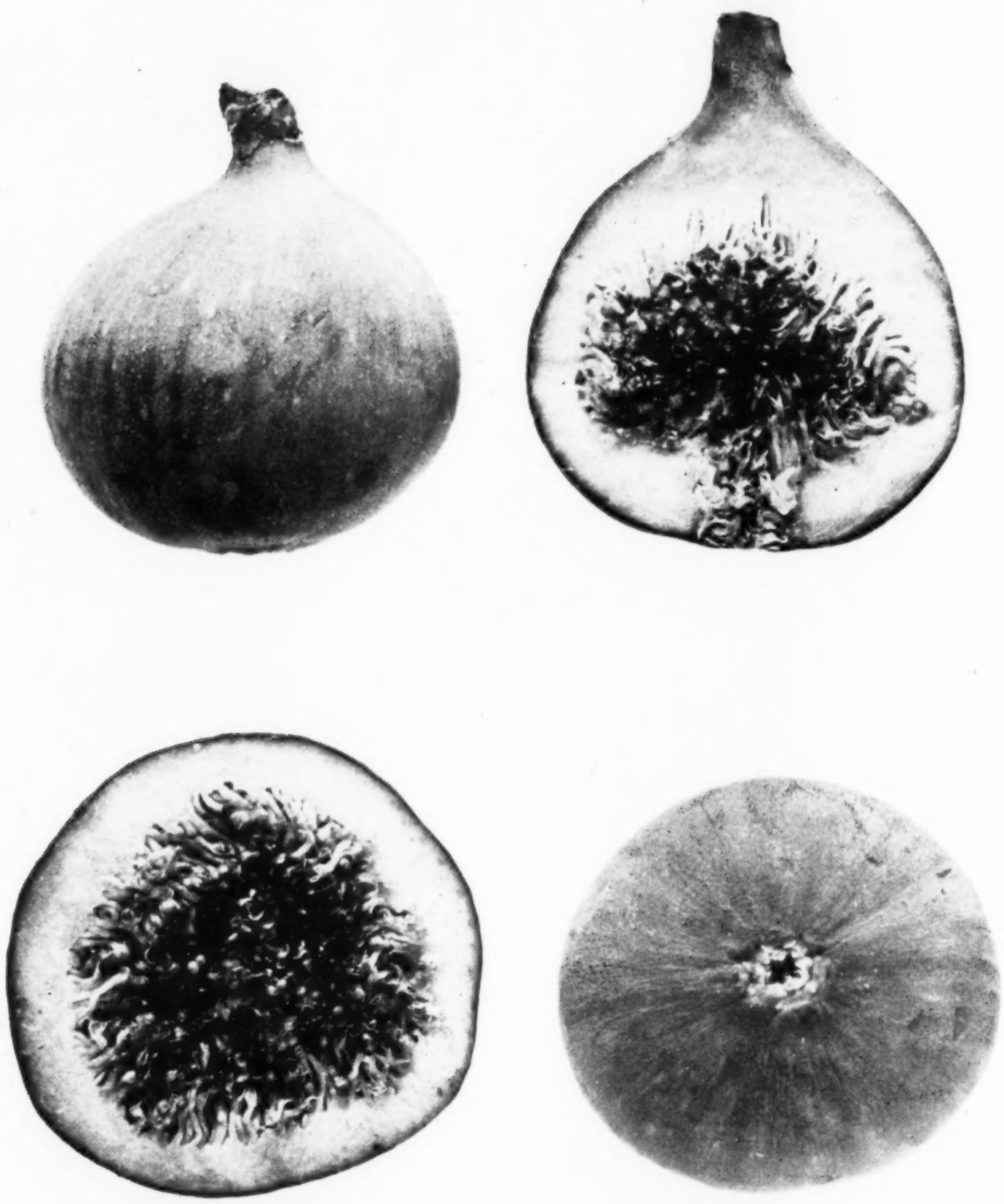
**THE EXCELSIOR CAPRIFIG**

**Figure 9**

The profichi† figs of the Excelsior caprifig are as large, if not larger, than those of any other named variety in California. Several hundred feet of cutting and scion wood from the original tree were sold at a dollar per foot. The tree is a seedling distributed by G. P. Rixford, San Francisco, and is on the place of H. P. Taylor, Exeter.

Convention of California that "there is nothing to indicate that the Symrna type of fig is very highly bred or very widely different from the wild type of figs. On the contrary, among even the few dozen edible figs secured by Mr. Maslin, there are several that are equal, if not superior, to the commercial Smyrna variety", which is doubtless a chance seedling of Asia Minor. At the convention held at Sacramento later in the same year Swingle gave a more complete report on the Maslin fig orchard and its bearing on the Smyrna fig industry of this country. He announced the plan of the Bureau of Plant Industry to distribute for trial, cuttings of the best Maslin varieties and seedlings from crosses made at Loomis and other stations. The announcement was later embodied in circulars published by the Bureau. Several thousand cuttings and seedlings were subsequently distributed by Mr. G. P. Rixford of San Francisco to cooperators not only in California but also in Arizona and various other states. It was stipulated that for every

*The Smyrna type of fig is a dioecious species, and the male trees are called caprifigs. There are three crops of caprifigs each year, often called by their Neapolitan names: the *profichi* (spring crop), *nammoni* (summer crop), and *mamme* (winter crop). While the caprifigs are not themselves edible, it is important to have caprifig varieties that produce a continuous succession of large fruit, as the Blastophaga insect (which performs an indispensable function in fertilizing the female fruit of the edible Smyrna varieties) breeds only in the caprifigs. Abreak in the succession of caprifigs may cause the destruction of the Blastophaga and thus the total failure of the Smyrna fig crop.—*Editor*.



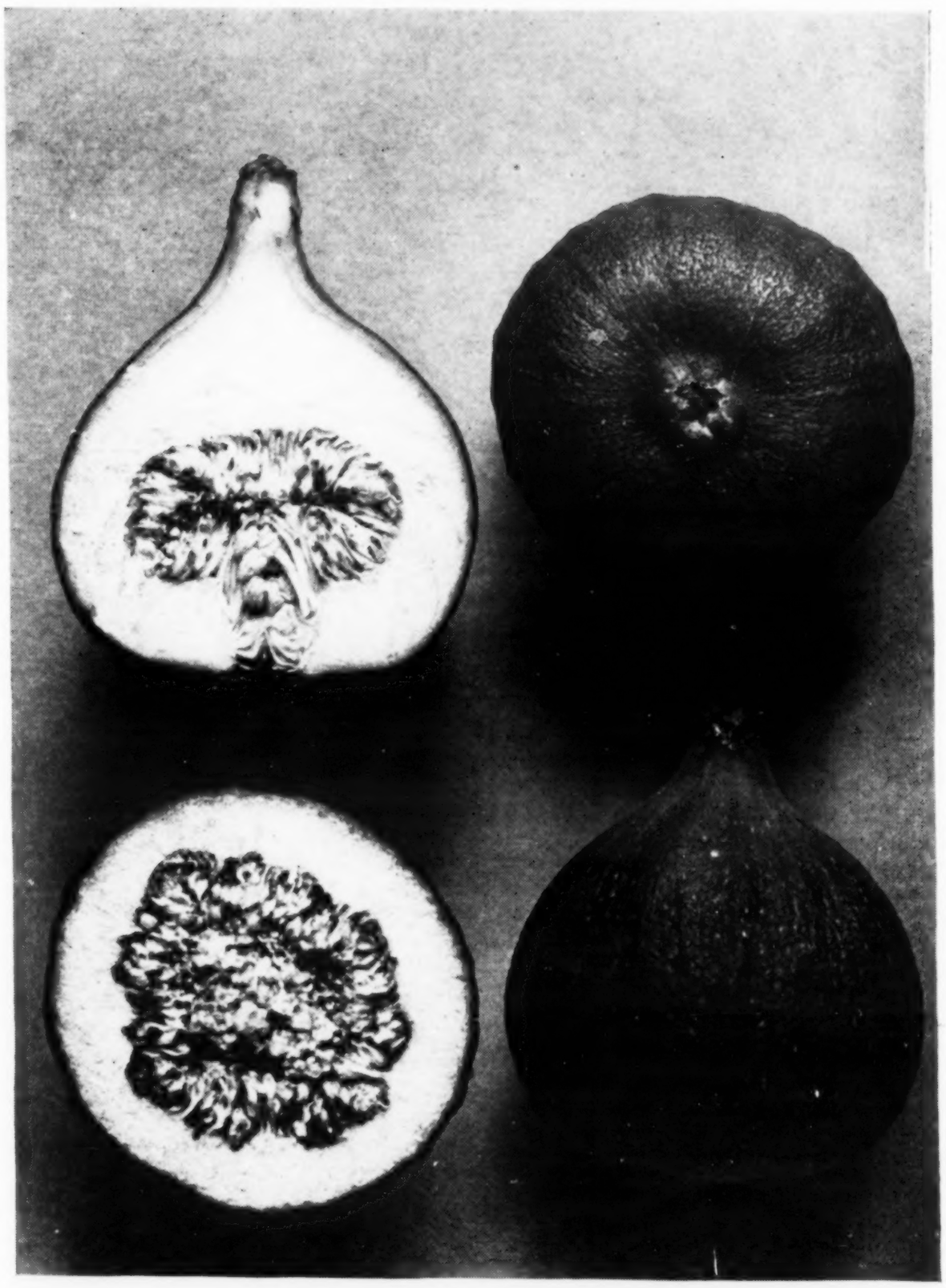
## A PROLIFIC FIG SELECTION

**Figure 10**

The Kearney caprifig is the best one of several seedlings growing at Kearney Park, California. The tree produces all three crops in abundance but is especially prolific of mammoni figs, the crop in which most varieties are weak.

three seedling figs properly set out and cared for, the Department of Agriculture would furnish one cutting of a selected variety of caprifig or of an edible fig of the Smyrna type. On account of the wide geographical distribution of this material, it was physically impossible for an agent of the Department to investigate personally any large number of the fruiting trees. Furthermore, growers who received free plants often failed to give them a fair trial or to send in fruit for examination. The plan, therefore, has recently been discontinued in favor of testing out seedlings on Department land before distributing them to growers for further trial.

In his bulletin, "Smyrna Fig Culture", Rixford published a list of the



**A PROMISING SEEDLING**

**Figure 11**

The Forbes is another of the Rixford seedling caprifigs which is especially productive of the mammoni crop. The original tree is on the place of C. T. Forbes, near Fresno. The figs shown above are of the profichi crop.

fig varieties originating in the Maslin orchard. One of these, named by Swingle, the Rixford, was selected because "as it ripens, a drop of pellucid gum gradually hardens in the mouth of the fig, effectually sealing it against filth, beetles, and all other insects. This variety does not sour, because the germs that cause fermentation cannot effect an entrance." Trials of the Rixford fig in other parts of the state, however, have shown that the character for self sealing is not constant, and that the figs do not self seal any better than the Calimyrna. The figs are susceptible to splitting, and the red pulp makes them undesirable for canning. The variety, therefore, has not become commercially established in California. Other Maslin varieties of the Smyrna type are as follows: Eisen, a self sealing fig at Loomis; Hilgard, reported as almost immune from splitting; and West, one of the sweetest and best figs in the orchard. The caprifig varieties from this orchard are: Loomis, Newcastle, Mason, and Bleasdale. These and other numbered varieties of caprifigs are widely distributed and some are regarded highly by growers.

As pointed out by Rixford the process of crossing figs is very simple. Receptive figs of the desired varieties are enclosed in a tight paper bag, and a few days later one caprifig with Blastophaga ready to issue, is placed in the bag. After a week or ten days the paper bag can be replaced with one of cheesecloth to protect from birds the ripening caprified figs. Mr. Rixford thus successfully crossed more than fifty varieties of the Adriatic class with various caprifigs. Out of the thousands of seedlings grown and distributed, however, none has so far become commercially prominent as an edible fig, although several have valuable characteristics. A few promising varieties of caprifigs have appeared which are being widely grown, among them the

Kearney, Forbes, and Excelsior, recently described by the writer in an appreciation of the fig-breeding work of Mr. Rixford.

Judging from past experience, color of skin is not a dominant factor in figs. In his autobiography, Burbank stated; "I have grown seedlings in abundance, but ninety-nine out of one hundred produce worthless fruit. You plant seeds of the white fig and you are quite as likely to get black or brown figs as white ones." Rixford crossed Black Douro with Maslin Capri No. 91, also black, but some of the seedlings produced white or light green figs.

A project in fig breeding was undertaken at the Yuma (Arizona) Experiment Farm a number of years ago. The report of the work of this farm for 1919 and 1920 gives the following summary of the project:

> In 1912 1,600 seedling figs which were crosses between the Smyrna and common varieties were planted. The purpose of this test was to obtain, if possible, some new varieties which would have the excellent qualities of the Smyrna but would not need insect pollination to set fruit, as required by that variety.
>
> The results of eight years' work with this test show that 384 trees, or 24 per cent, produced mature fruit. Of this number there were 62 which had fruit ranging from fair to good in quality. Up to the present time the quality of the fruit from the seedlings has been inferior to that from the trees of named varieties.

An account of seedling figs in California would not be complete without mentioning the indefatigable work of Francis Heiny of Brawley. Mr. Heiny has had available for crossing both staminate and pistillate forms of three species, *Ficus carica*, *F. pseudo-carica*, and *F. palmata*. Some of the first generation hybrids have borne edible fruit with desirable characteristics. The hybrid caprifigs, however, are of greatest interest, since they produce pollen in the figs of all three crops, a desirable factor in fig production.

The four leading varieties of figs grown in California are, Calimyrna, Adriatic, Mission, and Kadota, all having originated in the Old World. In various articles the writer has discussed the qualities of these varieties and in 1921 he stated: "Each one, however, has faults or disadvantages which seriously curtail production, lower the grade and quality of the fruit, and reduce the profits to the grower." "One prominent horticulturist of California has stated that the only trouble with the Mission fig is its color. A white variety as good as the Black Mission is, therefore, greatly to be desired."

The desirability of developing improved fig varieties by breeding was recognized a few years ago when the California Experiment Station started a comprehensive study of fig diseases under the direction of Professor R. E. Smith. His statement of the objectives is thus given in the 1922-23 Report:

> The fact that certain fig varieties are practically exempt from disease of any sort indicates the possibility of obtaining varieties having such qualities and at the same time such other desirable characteristics as color and quality. There is particularly desired a good white fig, immune to disease and producing three crops of fruit a year without caprification. A fig like the Black Mission but with white fruit would come close to meeting these requirements. Attempts are under way to breed figs for the purpose of producing such desirable varieties. In 1922 about two thousand seedlings were grown from Mission and Kadota seed, crossed with some of the ordinary capris. In the spring of 1923 these were planted near Auburn, Placer County, in semi-permanent orchard form in order to bring them into fruiting. During the summer of 1922 Miss Phillips hand-pollinated a large number of figs, crossing the Mission and Kadota with pollen from some of the so-called Maslin seedlings, which are seedlings from edible Smyrna figs. Several thousand of these seedlings are now growing.

Most of these fig seedlings were later set out at the Universtiy Farm, Davis, where they could be studied more closely.

The fig growers themselves have urged such a fig breeding project as attested by a resolution passed at the

State Fig Institute held at Modesto, January 18, 1924, requesting a special appropriation for fig investigations with the principal object of developing drying varieties resistant to splitting and souring, of testing out new and desirable foreign varieties, and of developing new seedlings.

The results and possibilities of planting fertile seeds of edible figs have already been discussed in this article. The presence of fertile seeds in caprifigs, principally in the mammoni crop, has long been known. Both Longo in Italy and Rixford in California have reported the planting of such seeds, and Longo found that the seedlings produce caprifigs and edible figs in about the same ratio as seedlings from other crosses. It would seem, however, that the possibilities of this method of fig breeding have not been sufficiently considered. The flowers of mammoni figs fertilized with pollen from profichi figs on the same tree would be self-fertilized. Characters such as size, color, shape, smallness of eye, vigor, etc., should be better segregated in the seedlings than in crosses between two unlike parents.

Inbreeding was suggested as long ago as 1901 by Dr. Eisen as follows: "While it may be unnecessary at present to raise seedlings from edible varieties in order to produce other edible kinds, it is not only not unnecessary, but highly desirable, that we should raise new varieties of caprifigs from seed of caprifigs." Further work with this inbreeding of figs is being prosecuted by the writer.

## Summary

A survey of the available literature indicates that commercial varieties of figs in Eurasia have originated as chance seedlings. While some attempts at systematic fig breeding have been made, no records of marked improvement in varieties have been noted as a result of such breeding.

Numerous attempts to produce better parthenocarpic varieties in the southern United States have also largely shown discouraging results.

While thousands of fig seedlings of three types, common, Smyrna, and caprifigs, have been grown and distributed in California during the past four decades, none have so far become established commercially, although several have valuable characteristics.

The desirability of developing improved fig varieties by breeding, however, is still recognized in California. Both the United States Department of Agriculture and the California Experiment Station are growing numerous fig seedlings in the hope of finding a white variety as good as the Black Mission, a good Smyrna fig resistant to splitting, common figs immune to souring, and improved varieties of caprifigs.

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## Four Prizes for Eugenics Essays

TWO prizes are offered by the Eugenics Research Association for the best essays written by an American author on the topic: "A comparison of both the crude birth-rate, the birth-rate per 1000 females 15 to 45 years of age, and the 'vital index' (or $\frac{100 \text{ births}}{\text{deaths}}$ ratio) of the Nordic peoples and non-Nordic peoples in the Americas." Data are to be considered in different periods from 1850 to the present time, or that of the last available census or registration. Nordic peoples in the Americas are considered to be those whose ancestors came mainly from Nordic countries.

For the purposes of this investigation Nordic countries are defined as including the Scandinavian countries south of about 63° N. lat., the Netherlands, England, Scotland, North Ireland and the German States of Schleswig-Holstein, Mecklenburg, Hannover and Westphalia. Any other section of Europe, any part of Asia, and Africa north of the Zambezi, may be regarded, for the purposes of this study, as "non-Nordic."

The prizes offered are: $1,000 for the best essay, and $200 for the second best. The essay is to be typewritten in the English language. It is to be mailed in time to reach Cold Spring Harbor by February 1, 1929. The name of the author is not to be written on the essay, but placed, with address, in a sealed envelope enclosed in the package containing the manuscript. Manuscript and envelope are to be endorsed with the same motto.

Two prizes of the same amounts also offered for the best essays written by European authors on the following subject: "A comparison of both the crude birth-rate, the birth-rate per 1000 females 15 to 45 years of age, and the 'vital index' (or $\frac{100 \text{ births}}{\text{deaths}}$ ratio) of the Nordic peoples and non-Nordic peoples in Europe." Data are to be considered in different periods from not earlier than 1850 to the present time, or that of the last available census or registration. The essays are to be in English, German, or French, and must reach Cold Spring Harbor, New York, by February 15, 1929.

All communications to be addressed to: Eugenics Research Association, Cold Spring Harbor, Long Island, New York, U. S. A.

# INHERITANCE OF COLOR, BEARD, TASSELS AND HORNS IN THE GOAT

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## *I. Color*

FROM an examination of the Kid Register of the British Goat Society it was found possible to obtain certain indications as to the color of parents and offspring registered therein. This register records kids born between 1884-1923, inclusive, when the record was closed. Herd book data are never too reliable, especially in the case of coat colors in which, particularly in the goat, considerable blending occurs. Although the figures here presented can not be considered as conclusive, they are, at least, suggestive and may clear the way for further investigation.

The chief colors are black, chocolate, fawn, cream, brown, red, tan, grey, roan, and white. Several other colors, chestnut, mouse, drab, chinchilla, and biscuit occur considerably less frequently, while many other shades which are described can be placed provisionally in one of the main color groups.

### The Black Series

There appear to be two large groups of which black and either tan or red may be taken arbitrarily as the basic colors respectively. The black group has many modifications in the form of dilutions into chocolate, fawn, cream, and dirty white. As may be readily understood, these colors blend into each other at the extremes, and so, apart from any herd book inaccuracies, exact description is difficult. Table I shows the mating of goats in the black series. All the colors are self or self with white. All matings involving Toggenburg goats, when this is the sole color description, have been omitted. Toggenburg, by definition (Brit. Goat Society, *Year Book*, 1926, p. 153) is anything from light drab to dark chocolate. In the writers' experience it also includes blue, fawn and brown. In the figures given below all the produce of "Champion Prophet of Bashley" have been omitted. He was entered as black and white, but examination revealed that he had many grey hairs in his coat.

Table I shows with a fair degree of conclusiveness that black is recessive to fawn, the latter being at the top of the series of these three colors, though it is probable that a still lighter modification, cream, is above it. It is difficult to distinguish between white and cream in the kid coat, especially if the animal is less than five months old.

Table II shows matings involving cream. No records were obtained of matings of cream by white.

**TABLE I—Matings involving Black, Chocolate and Fawn.**

| *Mating* | *Offspring* | | |
|---|---|---|---|
| | *Black* | *Chocolate* | *Fawn* |
| Black × Black | 127 | 2 | .... |
| Black × Chocolate | 38 | 22 | 3 |
| Black × Fawn | 35 | 26 | 23 |
| Chocolate × Chocolate | 7 | 20 | 1 |
| Chocolate × Fawn | 13 | 36 | 42 |
| Fawn × Fawn | 8 | 12 | 49 |

**TABLE II—Matings involving Cream.**

| *Mating* | *Offspring* | | | |
|---|---|---|---|---|
| | *Black* | *Chocolate* | *Fawn* | *Cream or White* |
| Cream × Black | 15 | 1 | 5 | 18 |
| Cream × Chocolate | 4 | 3 | 3 | 13 |
| Cream × Fawn | 5 | .... | 3 | 8 |
| Cream × Cream | .... | .... | 1 | .... |

These figures give the impression that cream is dominant to the other colors in the series, but owing to the confusion between cream and white this cannot be stated as a fact.

### Black Series and Brown

The largest number of browns occurring in matings of the black series to black series was produced by the crosses, fawn × black = 21 brown, and fawn × fawn = 13 brown, fawn being a color easily confused with brown. Bearing this in mind, the table would appear to show that brown is dominant to the black series, but this must be regarded merely as a suggestion.

The safest conclusion to be deducted from Table IV is that brown appears to be dominant to tan and red. While one would like to make out that tan and red form a similar series to the black and recessive to it, the above figures give little indication beyond the suggestion that, if the footnote (†) be accepted as an indication that tan and red are easily confused with certain shades of fawn, tan and red may be considered to breed true and to be, therefore, recessive to the black series. There would appear to be some justification for this view.

Of the inter-relation of tan and red little can be said, but if these colors are not considered identical, then since red × red gave no tans, the inference must be that red is recessive to tan.

### Grey and Roan

In goats, as in cattle, there are at least two types intermingling white with the basal color. There are both grey and roan. Here the resemblance between the species ceases, for since the goat has so many shades of color, there are as many nuances of roaning. Red-roan, red-grey, and red-fawn have been grouped as roan, the remainder, including chinchilla as grey.

Tabulated, the matings of grey × black series gives:

| | | |
|---|---|---|
| Grey × Grey | 1 Black Series, | 4 Grey |
| Grey × Black Series | 56 | 25 |
| Black Series × Black Series | 543 | 30 |

Mating involving cream × cream and cream × white gave 1 roan and 45 other colors. Black × black gave only 2 grey in 147 progeny. In addition, fawn × brown gave 4 greys, red × fawn and tan × fawn, one each, and brown × brown, 2 greys. The indication is that grey is probably dominant to the black series and to reds and tans. It is not uncommon to confuse very dark grey with black, and possibly other sires occurred besides "Prophet of Bashley," who, although classed as black, were genetically grey. This would account for the 30 greys from the black series × black series matings.

### White

White is one of the most difficult colors to analyze. There are at least two kinds of white, the pure white of the Saanen and the white which is an extreme cream. There may also be a type due to extreme white spotting. It is usually very difficult to distinguish in the kid coat between the first two, although eventually the cream white usually develops in the adult coat into a kind of dirty white. White with dark spine has been omitted from consideration. It frequently occurs and is probably due to a pattern factor working, most likely, upon cream white.

**TABLE III—Matings of Brown with the Black Series (Cream=Chocolate=Fawn).**

| *Mating* | *Offspring* | |
|---|---|---|
| | *Brown* | *Black Series* |
| Brown × Brown | 29 | 21 |
| Brown × Black Series | 59 | 182 |
| Black Series × Black Series | 56 | 643 |

**TABLE IV—Matings of Tan, Red, Brown and the Black Series.**

| *Mating* | *Offspring* | | |
|---|---|---|---|
| | *Tan or Red* | *Brown* | *Black Series* |
| Tan or Red × Tan or Red* | 13 | .... | 9† |
| Brown × Brown | 3 | 29 | 21 |
| Brown × Black Series | 13 | 59 | 182 |
| Tan or Red × Black Series | 9 | 7 | 31 |
| Black Series × Black Series | 7 | 56 | 643 |

*Includes such color as "red-tan."
†8 of these were fawn and 1 black.

In the matings black × black, 2 whites were produced; in black × grey, 1; in black × brown, 2; and in brown × brown, 1. Eleven occurred in matings in which one parent was fawn and 29 when one parent was cream (9 from cream × cream), these may be legitimately regarded as the cream variety of white. The percentages of those whites whose parents were colored is so small, the largest is less than 3 per cent., that they may be ignored. If this is done, then white may be considered to be dominant to all colors. This is in accord with the results obtained by Lush[2].

Study of the matings recorded strongly suggests that broken color is dominant to self coloration. The exceptions are small in proportion to the total numbers, and mostly occur in the colors in which comparison of shades is difficult.

## II. The Beard

Information regarding the mode of inheritance of the beard was obtained from personal observation of goats, from the collection of photographs in the possession of Mr. J. N. Pickard, to whom the writers are indebted, and also from a limited questionnaire. All doubtful cases as well as those involving immature goats have been eliminated.

This would appear to be a case of sex limitation, the bearded character being dominant in the male and recessive in the female. The figures are not large but they are quite reliable. Most, if not all, of the buck goats which are designated "beardless" have a few hairs suggestive of a beard, but, when compared to a bearded buck, the distinction is quite clear. In the records above, the beardless bucks did possess a few such hairs. Many male kids are slaughtered soon after birth and thus no record can be obtained of the beard, which develops at puberty in both sexes.

## III. Tassels

Tassels or wattles occur more commonly in goats than in any other class of farm live stock, though they are not uncommon in certain strains of pigs and sheep. In the goat they occur most frequently in the Swiss breeds and are usually absent in the Nubian and English races.

The data presented in this paper regarding the mode of inheritance of this characteristic were obtained from the same sources as the data regarding the beard, and may be considered to be reliable.

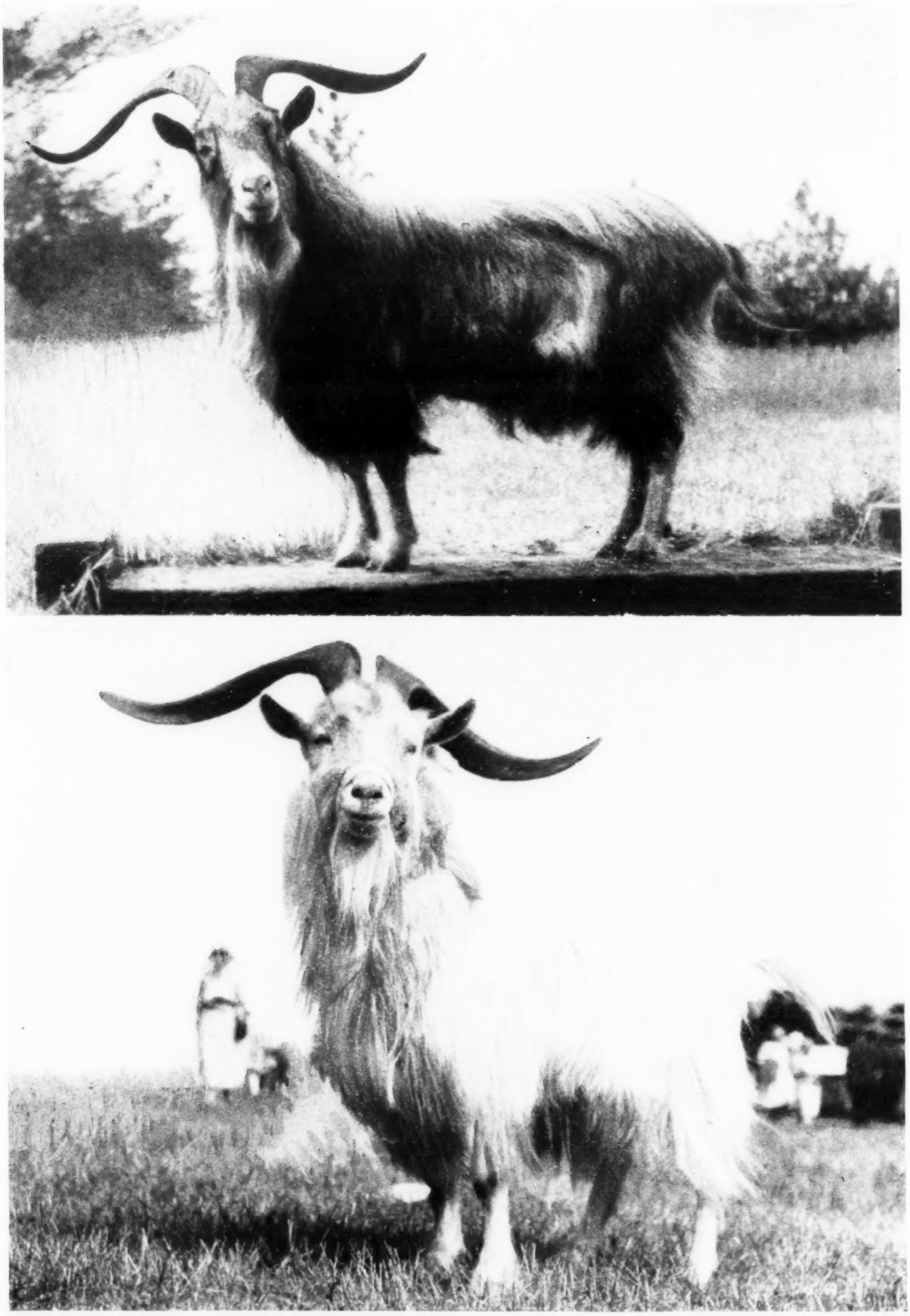
The parents of the four female kids, the progeny of the mating untasselled × untasselled were not bred in the herds in which the kids were registered. Letters were sent to the breeders asking for further particulars, especially as to whether the parents were naturally untasselled or had had their tassels removed. In the case of two it was established that the parents were born without tassels. Concerning the parents of the other two, in one case there was some doubt as to whether the kid herself was tasselled and also as to whether her sire was naturally without tassels; in the other case it was definitely ascertained that the sire

**TABLE VI—Matings of Bearded and Beardless Goats**

| *Parents* ♂ | ♀ | *Offspring* *Bearded* ♂ | ♀ | *Beardless* ♂ | ♀ |
|---|---|---|---|---|---|
| Bearded × | Bearded | 19 | 32 | .... | 21 |
| Bearded × | Beardless | 15 | 10 | .... | 21 |
| Beardless × | Bearded | .... | .... | 1 | .... |
| Beardless × | Beardless | .... | .... | .... | 3 |

**TABLE V—Matings of White with colors.**

| *Mating* | *Offspring* *White* | *Gray* | *Red or Tan* | *Brown* | *Black Series* |
|---|---|---|---|---|---|
| White × White | 14 | 1 | .... | 1 | 1 |
| White × Grey | 5 | .... | .... | 1 | 4 |
| White × Brown | 3 | 3 | .... | 4 | 1 |
| White × Black Series | 60 | 6 | 1 | 4 | 55 |



**BEARDED GOATS**

**Figure 12**

Two of the individuals used in this study of the inheritance of beards in goats. The beardless male goats also show a few chin hairs, but the distinction between bearded and beardless is clear-cut.

had had one tassel on the ear and that it had been removed.

These figures, even to the exceptions, are in agreement with those obtained by Lush and support his view that, in general, tassels are dominant in their mode of inheritance. Regarding the exceptions, it may, perhaps, be assumed that the factor for tassels needs the cooperation of other factors and that these are present in the majority of goats but not always so. Although tassels are practically unknown in the Anglo-Nubian breed, Herd Book animals occasionally turn up with tassels. To test the purity of the breed, an examination of the pedigrees of all Anglo-Nubians recorded between August, 1913, and December, 1925, was made. These pedigrees were traced as far back as the herd book would allow. The only alien blood found in the pedigrees was in five cases, three where an imported Toggenburg occurred as the grandsire or further back on the dam's side, one where a Dutch goat occurred fairly far back in the ancestry, and one tracing distantly to a Pyreneean doe. It is concluded that probably the occasional occurrence of tassels in the Anglo-Nubian is due to this slight admixture, but the possibility of other factors being at work cannot be ignored.

## IV. Horns

The Kid Register provided a good deal of data which confirmed the view put forward by Asdell and Crew[1] that the polled condition is due to a simple dominant. It also threw some interesting light on the exceptions to this rule which were mentioned in that paper. Two of these exceptions are definitely contradicted by the Kid Register entries and in two more the corresponding place is left blank. There was only one entry in the Herd Book which was confirmed by enquiry, the case of the polled buck, "Sherwood Archer," by "Sepa" (horned) out of "Stanmore Bluebell" (horned). The Kid Register records that the sire, "Sepa," was first entered as horned but this was corrected in a subsequent letter to hornless, thus casting considerable doubt on the authenticity of the one major exception.

## Summary

I. Color. From examination of the Kid Register of the British Goat Society it was inferred that the following was the mode of inheritance of various color characteristics, though in no case was conclusive evidence forthcoming that these results are correct.

Black appeared to be the lowest term in a series, black, chocolate, fawn, cream, the last being dominant to the others.

Brown appeared to be dominant to all colors of the black series, and also to red and to tan.

Red and tan may form a series recessive to the black series.

Grey and roan appear to be dominant to the black series as well as to red and tan, but recessive to brown.

White may be dominant to all colors.

II. The beard is a case of sex limitation, dominant in the male, recessive in the female.

III. Tassels. The hypothesis that the appearance of tassels is due to the action of a single dominant factor appears to hold good in the majority of cases. But exceptions lead the writers

**TABLE VII—Matings Involving Tassels**

| *Mating* | *Offspring* | | | | | |
|---|---|---|---|---|---|---|
| ♂ ♀ | *Tasselled* | | | *Untasselled* | | |
| | ♂ | ♀ | *Total* | ♂ | ♀ | *Total* |
| Tasselled × Tasselled | 23 | 84 | 107 | 1 | 25 | 26 |
| Tasselled × Untasselled | 4 | 26 | 30 | 6 | 6 | 12 |
| Untasselled × Tasselled | 3 | 10 | 13 | .... | 5 | 5 |
| Untasselled × Untasselled | .... | 4 | 4 | 7 | 32 | 39 |

to the conclusion that the mode of inheritance is somewhat more complicated.

IV. Horns. Some of the exceptions found by Asdell and Crew[1] to the hypothesis that the polled condition is dominant are contradicted by an examination of the Kid Register.

### Literature Cited

1. Asdell, S. A., and Crew, F. A E. (1925), Inheritance of Horns in the Goat. *Jour. Genet.*, 15, p. 367.

2. Lush, J. L. (1926), Inheritance of Horns, Wattles, and Color in Grade Toggenburg Goats. *Jour. Hered.*, 17, p. 73.

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## Topsy-Turvy Genetics

The New Genetics, by Glenn C. La Master. Pp. 80. Published by the author, Akron, Ohio, 1928.

We have pure food laws, but it is still an unquestioned privilege to publish anything we can "get away with," short of using the mails to defraud. The present booklet is a case in point, and it comes very near to the latter category. We learn that fertilization is a process of the union of two cells, the male element forming the brain and spinal cord, the ovum the heart, the rest of the cells "just growing" like Topsy. We are informed that "full proof of this new theory of reproduction cannot be included in this work, for the most important evidence leads us extensively into another subject, and as the facts in the case are of no importance to the practical breeder it would only burden the reader with unnecessary details." We cannot but believe that the details would have been interesting, but they certainly could not have been as valuable as the priceless dictum that the "facts of the case are of no importance." The principle is one that should save research workers much needless trouble and worry, though it may prove expensive to breeders who are so "practical" as to adopt the La Masterian principles as their guide.

*R. C. C.*